ENERGY, MINES AND RESOURCES CANADA

REMOTE COMMUNITY DEMONSTRATION PROGRAM

REPORT

ENERGY PROFILES FOR MANITOBA REMOTE COMMUNITIES

JANUARY, 1983

ENERGY PROFILES FOR MANITOBA REMOTE COMMUNITIES

Executive Summary

The Remote Community Demonstration Program was introduced in 1982 as part of the federal government's off-oil initiatives. The program is designed to promote the awareness and adoption of energy conservation practices and alternative-to-oil energy sources in remote communities in Canada.

To help in the operation and future planning of the program, Energy, Mines and Resources Canada commissioned this "energy overview" study to identify and profile remote communities in Manitoba which are eligible under the program, and to identify potential alternative energy sources and energy conservation options open to these communities.

Basically, a "remote community" is defined as one that has at least 10 permanent residences, at least five years of planned life remaining and is not now connected or firmly committed to connection with piped natural gas or main electrical grids.

In Manitoba, 16 communities met this definition. They are Brochet, Garden Hill, God's Lake Narrows, God's River, Granville Lake, Lac Brochet, Oxford House, Pikwitonei, Pukatawagan, Red Sucker Lake, St. Theresa Point, Shamattawa, Tadoule Lake, Thicket Portage, Waasagomach and Churchill. The first 15, with a combined population of about 11,000, have similar demographic, economic and energy-use characteristics. The sixteenth, Churchill, with a population of about 1,600, has a much higher per capita consumption of energy, the result of higher living standard and greater economic activity.

All 16 communities depend on diesel fuel for electricity generation and on heating oil or propane for space heating in institutional and commercial buildings. In communities other than Churchill, wood (rather than heating oil or propane) is the main source of energy for residential space heating, cooking and water heating.

In 1982, Churchill consumed 544,644 GJ of energy. Oil products made up 80% of this total, and propane the remainder. The other 15 communities used 702,520 GJ of energy that year. Oil products, for commercial, institutional and space heating and electricity generation, accounted for 51%. Fuel wood, mainly for residential space heating, made up approximately 49%.

Because the cost of shipping oil and propane products into the communities is so high -- especially for small-volume users and communities accessible only by air -- energy costs are much higher than in the south. Transportation costs add about 20% to the Winnipeg price of bulk fuel in communities on the railroad, about 25% in places served by winter roads, and up to 100% in places where fuel is shipped by air.

The report concludes that four major opportunities exist to reduce energy usage and costs in the 16 communities. They are:

- using fuel wood to replace some 3,500,000 litres of heating oil used annually to heat public institutional and commercial buildings in the 15 similar communities;

- improving design and construction of houses to reduce, by several thousand cords per year, the quantity of fuel wood needed to heat existing and future homes;

- connecting certain communities to the main Manitoba Hydro electrical grid or harnessing small hydro-electrical generating opportunities near communities, to replace much of the 13,800,000 litres of fuel oil used annually to generate electricity; and

- substituting propane for electrical heating -- depending on the outcome of studies and negotiations -- to replace some 3,100,000 litres of fuel oil used annually for heating in Churchill.

The report describes in detail each remote community and its energy use.

The study was done in 1983 by Unies Consulting Engineers Ltd. of Winnipeg for the Remote Community Demonstration Program of Energy, Mines and Resources Canada.

PROFILS ENERGETIQUES DES COLLECTIVITES ELOIGNEES DU MANITOBA

Résumé

Le Programme de démonstration dans les collectivités éloignées, créé en 1982, constitue l'une des initiatives prises par le gouvernement fédéral en vue du remplacement du pétrole. Ce programme a pour but de faire mieux connaître et de faire adopter les pratiques qui engendrent des économies d'énergie et les sources d'énergie capables de remplacer le pétrole, dans les collectivités éloignées au Canada.

Pour aider à l'application de ce programme et à sa planification dans l'avenir, Energie, Mines et Ressources Canada a commandé une étude globale sur la situation énergétique au Manitoba afin de découvrir quelles collectivités éloignées sont admissibles au Programme et quelles sources d'énergie de rechange et mesures d'économies d'énergie s'offrent à elles.

Fondamentalement, une "collectivité éloignée" se définit comme une collectivité qui compte au moins dix résidences permanentes, qui n'est pas reliée aux principaux réseaux de transport d'électricité ou de gaz naturel et dont l'espérance de vie est d'au moins cinq ans encore.

Au Manitoba, 16 collectivités répondent à cette définition. Il s'agit de Brochet, Garden Hill, God's Lake Narrows, God's River, Granville Lake, Lac Brochet, Oxford House, Pikwitonei, Pukatawagan, Red Sucker Lake, St. Theresa Point, Shamattawa, Tadoule Lake, Thicket Portage, Waasagomach et Churchill. Les quinze premières, qui regroupent une population d'environ 11 000 personnes, ont des caractéristiques semblables, aux points de vue de la démographie, de l'économie et de la consommation d'énergie. A Churchill, où la population s'élève à environ 1 600 personnes, la consommation d'énergie par habitant est beaucoup plus élevée, le niveau de vie et l'activité économique étant supérieurs.

Ces 16 collectivités produisent de l'électricité à partir de carburant diesel et chauffent les locaux de leurs établissements publics et immeubles commerciaux au moyen de propane ou de mazout. A l'exception de Churchill, ces collectivités utilisent du bois (plutôt que du mazout ou du propane) comme principale source d'énergie pour le chauffage des lieux, la cuisine et le chauffage de l'eau dans les résidences.

En 1982, on a consommé 544 644 GJ d'énergie à Churchill. Les produits pétroliers constituent 80 % de ce total et le propane, les 20 % qui restent. Les 15 autres collectivités ont consommé un total de 702 520 GJ d'énergie cette année-là. Les produits pétroliers utilisés pour produire de l'électricité et chauffer les établissements publics et les commerces ont fourni 51 % de cette énergie. Le bois, utilisé principalement pour chauffer les résidences, en a fourni environ 49 %.

A cause du coût élevé du transport du pétrole et du propane jusqu'à ces collectivités, particulièrement en ce qui concerne les petits utilisateurs et les collectivités accessibles seulement par avion, le prix de l'énergie y est beaucoup plus élevé que dans le Sud. C'est ainsi que le combustible en vrac coûte environ 20 % de plus qu'à Winnipeg dans les collectivités situées le long d'une voie ferrée, environ 25 % de plus dans les collectivités accessibles par route même en hiver et jusqu'à 100 % de plus dans les collectivités ravitaillées par avion.

Selon le rapport, quatre grandes mesures permettraient de réduire la consommation et le coût de l'énergie dans ces 16 collectivités.

- utiliser le bois pour remplacer quelque 3 500 000 litres de mazout qui servent chaque année à chauffer les établissements publics et immeubles commerciaux dans les 15 collectivités semblables;

- améliorer la conception et la construction des maisons dans le but de réduire, de plusieurs milliers de cordes par année, la quantité de bois nécessaire au chauffage des maisons actuelles et futures;

- relier certaines collectivités au réseau principal d'électricité du Manitoba ou construire des petites centrales hydroélectriques près de ces collectivités, afin d'économiser une grande partie des 13 800 000 litres de pétrole utilisés chaque année pour produire de l'électricité; et

- chauffer les locaux au propane plutôt qu'à l'électricité - selon les résultats des études et des négociations - afin de remplacer environ 3 100 000 litres de mazout utilisés chaque année pour le chauffage à Churchill.

Le rapport décrit en détail chaque collectivité éloignée et l'utilisation qu'elle fait de l'énergie.

Cette étude a été effectuée en 1983 par Unies Consulting Engineers Ltd., de Winnipeg, pour le Programme de démonstration dans les collectivités éloignées d'Energie, Mines et Ressources Canada.

ENERGY, MINES AND RESOURCES CANADA

REMOTE COMMUNITY DEMONSTRATION PROGRAM

REPORT

ENERGY PROFILES FOR MANITOBA REMOTE COMMUNITIES

JANUARY, 1983

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January 26th, 1983

File #502-100

Conservation and Renewable Energy Office,
Energy, Mines and Resources Canada,
#112 - 110 Osborne Street South,
WINNIPEG, MANITOBA
R3L 1Y5

Attention: L. P. Haberman

Dear Sirs:

Re: Manitoba Remote Community Energy Profiles

The attached is our report providing energy profiles for 16 remotely located communities in Manitoba. The communities were studied to provide background information for development of demonstration projects directed toward a reduction in reliance of these communities on imported fuels, principally heating and diesel fuel oil.

With the exception of the town of Churchill, these communities show a strong similarity in energy utilization, in terms of both source distribution and per capita consumption. With respect to consumption of imported fuels in these 15 communities it is significant that practically all of the fuel imported is oil. The largest portion of this, 62 percent, is consumed for electrical generation and the remainder for space heating of institutional buildings and residences, with an additional small consumption by commercial establishments. Full-time residents heat almost exclusively with wood. Easily recognized opportunites for replacement of this fuel are the use of wood for institutional and commercial space heating and replacement of the existing diesel electric generating plants with local hydro electric generation or, in some cases, interconnection to the province's central electric transmission network. Practically complete replacement of imported energy sources is a possibility in some cases. The inferred impact on the existing transportation infra-structure and on local employment have not been examined, but should be recognized as important.

.../2

UNIES Ltd.
Consulting Engineers

The town of Churchill's energy supply is practically all imported and consists of diesel fuel oil for electric generation and fuel oil and propane for space heating. The most obvious opportunity for replacement of these imported fuels is with electrical energy supplied by interconnection with the province's central transmission network.

In all 16 communities there is opportunity over the long term to reduce heating energy demand, whatever its source, by the adoption of building design and construction standards which will reduce heat loss.

We hope that the information in the report will provide a suitable background for development of energy replacement and conservation projects. The opportunity to take part in this interesting study is greatly appreciated.

Yours very truly,

Gordon Spafford

Gordon Spafford, P.Eng.,
UNIES Ltd.

PROVINCE OF MANITOBA
A. G. SPAFFORD
REGISTERED ENGINEER

GS/dw
Encl.

ENERGY, MINES AND RESOURCES CANADA

REMOTE COMMUNITY DEMONSTRATION PROGRAM

REPORT

ENERGY PROFILES FOR MANITOBA REMOTE COMMUNITIES

This report was prepared with a contribution from the Remote Community Demonstration Program of Energy, Mines and Resources Canada (EMR). Distribution of this report by EMR does not necessarily signify that the contents reflect the views and policies of EMR. Mention of trade names and commercial products does not constitute recommendation or endorsement for use.

January, 1983

UNIES Ltd.

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Canadian National Railways

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Environment Canada, Atmospheric Environment Service

Frontier School Division No. 48

Health and Welfare Canada, Medical Services Branch

Hudson's Bay Company

Keewatin Tribal Council

Manitoba Department of Health, Community Health Services

Manitoba Department of Highways and Transportation, Airports and Marine Division

Manitoba Department of Natural Resources

Manitoba Department of Northern Affairs

Manitoba Hydro

Manitoba Telephone System

National Harbours Board, Port of Churchill

National Research Council of Canada

Paul's Hauling Ltd.

Port of Churchill Development Board

Public Works Canada

Royal Canadian Mounted Police

Steelgas Utilities Ltd.

Supply and Services Canada

Transport Canada

In addition, many staff of these groups took time and trouble to provide useful clarification and assistance on request. We recognize these contributions with gratitude.

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CHAPTER 1

1.0 INTRODUCTION

1.1 REMOTE COMMUNITY ENERGY PROBLEMS

Several communities in Manitoba have neither all weather road access to the Provincial highway system or transmission interconnection with Manitoba's central supply network. Most exist because they are the established or preferred place of residence of people who derive their livelihood from utilization of the natural resources of remote, undeveloped and unpopulated lands. A few such as Churchill or communities on the railway line to Churchill, have developed out of a requirement for personnel to serve industry, principally transportation.

In recent years services in these communities have become more sophisticated and institutional activity has increased. These changes have had a marked impact on many consumer demands in the communities. The demand for energy has increased dramatically and the types of energy utilized have expanded. With the exception of a limited electrical service, native residents rely mainly on local fuel supplies for their energy needs, much as they have for many generations. However, institutional and commercial activities and resident service personnel import fuels and utilize energy sources in much the same way they would in the populated areas of the Province. These fuels, including diesel oil for electrical generation, are imported to the communities at a considerable cost. Recently, cost of these energy sources has increased at a dramatic

rate, and this has stimulated an interest in finding ways to conserve these imported fuels and to replace them with local energy sources. Energy, Mines and Resources Canada has initiated activities to explore conservation and replacement opportunities.

1.2 PURPOSE AND OBJECTIVE

This report presents the results of an investigation of energy supply and consumption in sixteen remote communities in Manitoba. It has been prepared for Energy, Mines and Resources Canada who, under the Remote Community Demonstration Program and other applicable energy utilization and conservation programs, has undertaken to investigate and demonstrate the use of alternative energy sources and conservation measures for remotely located communities in Manitoba. This investigation represents a preparatory step in decreasing the dependence of these communities on imported fuels and, where economically viable over the medium and long term, replacement of these energy sources with locally available renewable and nonrenewable sources.

The objective of the study was to prepare a concise profile of the energy demand and potential supply characteristics of each remote community in Manitoba. A remote community is defined as one not connected to natural gas and the central grid electrical supply system and for which there is no commitment to provide connection. The communities so identified are listed in Table 1.1 with current population figures and administrative classification. Figure 1 presents a map showing remote community locations.

TABLE 1.1

ENERGY PROFILE STUDY - MANITOBA REMOTE COMMUNITIES

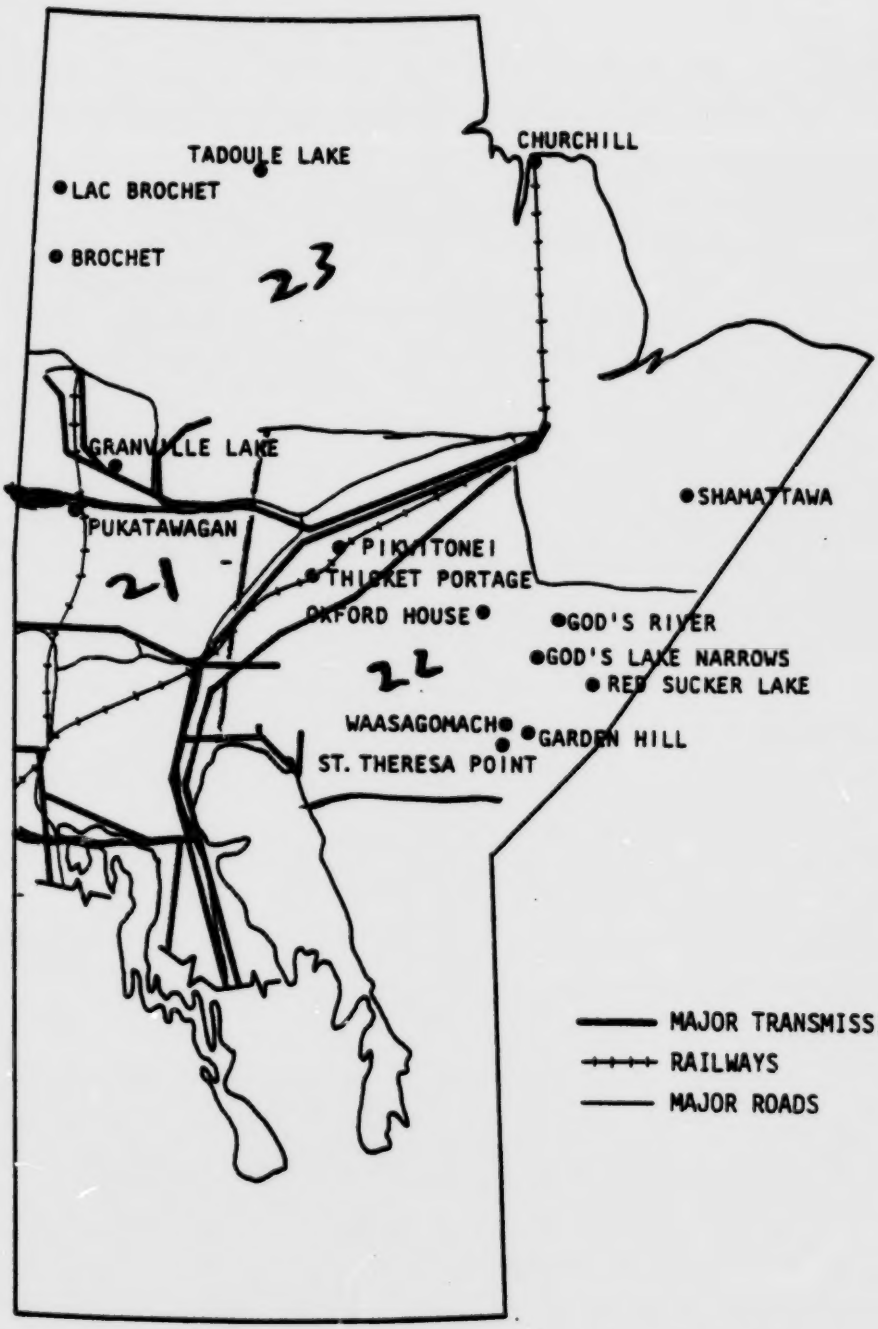
Community	Population	Approximate Composition	
		Treaty[1]	Non-Treaty[2]
Brochet	640	50%	50%
Garden Hill	1800	90%	10%
God's Lake Narrows	1250	80%	20%
God's River	250	≈100%	-
Granville Lake	140	-	100%[3]
Lac Brochet	380	≈100%	-
Oxford House	1250	95%	5%
Pikwitonei	240	-	100%
Pukatawagan	1100	95%	5%
Red Sucker Lake	425	90%	10%
St. Theresa Point	1450	95%	5%
Shamattawa	680	≈100%	-
Tadoule Lake	215	≈100%	-
Thicket Portage	200	-	100%
Waasagomach	730	≈100%	-
Churchill	1600[4]	-	-

1. Administered by Department of Indian and Northern Affairs, Canada.

2. Administered by Manitoba Department of Northern Affairs.

3. Many of the residents of Granville Lake are members of the Mathias Colomb Band at Pukatawagan.

4. Population of Churchill is mainly mixed European.



LOCATION OF REMOTE COMMUNITIES
MANITOBA

FIGURE 1

This report is intended to serve as background information for applicants submitting Remote Community Demonstration Program proposals and for the Department of Energy, Mines and Resources in evaluating these proposals.

1.3 DEMOGRAPHIC AND ECONOMIC SETTING

Of the sixteen communities studied, all but the town of Churchill exhibit very similar demographic and economic characteristics. Therefore, this section is divided into two subsections presenting the general demographic and economic settings, the first for the fifteen similar remote communities and the second for the town of Churchill.

1.3.1 Remote Communities

The fifteen communities are much studied, and it is not useful in a report on energy consumption to deal at length, or in depth, with demographic and economic patterns within them, except to note those salient factors which may be expected to affect energy supply or demand at present or during the decades to come. These communities have a total population of approximately 11,000 in early 1983. The smallest community is Granville Lake, with an estimated population of 140, the largest is Garden Hill with an estimated 1,800. The communities are characterized by unusual demographic patterns. Studies and reports prepared for agencies of the two governments reveal that, relative to Canada and Manitoba averages, birth rates are very high, population growth is very rapid, and the proportion of the population in the lower age cohorts is very high.

This youthful and rapidly reproducing population may be expected to continue to grow. Patterns of migration are changing, but still leave the majority of the population increase in the remote communities. Whether or not this will continue remains to be seen. Migration to southern communities, especially to cities, is a well established and probably growing trend. In brief, there is no evidence at this time of a decline in the rate of population increase, but there is some evidence that geographic dispersal may be occurring at an increasing rate. Such a trend could affect the future size of the remote communities.

Measured by average Canadian standards, economic conditions in the remote communities are unsatisfactory. Per capita incomes range from about one eighth of Manitoba levels to about one quarter in one or two of the more prosperous communities. Files of the Department of Indian Affairs and Northern Development indicate per capita income in 1974-75 in the range of $400 to $900. Employment, in the ordinary sense of full-time wage or salary-paid occupations, is very scarce and confined largely to institutional employers, usually government. Many of the people so employed are not native residents of the communities, but outsiders possessed of the skills necessary to win employment as teachers, nurses or administrators. Many local residents gain some income from trapping, fishing or other employment related to resource extraction. Some find work in northern mining communities, or elsewhere, and return to the remote communities after a few weeks or months possessed of some savings from such earnings. (Tracing and measuring such income sources is difficult, and estimates of income and wealth in the communities should therefore be viewed with some

skepticism.) Finally, the efforts of government to alleviate problems and disadvantages of limited employment opportunities through project employment of one kind and another, have contributed, and continue to contribute occasional income to residents of the communities.

The natural resource base in and around the remote communities is not rich in the commodities that a modern industrial economy values highly. Forest harvests are modest, and for local use. A few fish are harvested for export and a modest quantity of fur. There is no agriculture. Limited access and expensive transportation, among other factors, discourage the development of export-oriented production of most products, and no doubt there are other impediments to development of industry and commerce.

The communities are far from being self-reliant. Education service, health service, police and public administration are provided with funds allocated from sources outside of the communities. Most clothing, most foodstuffs, such machinery, tools and equipment as are to be found, and even most building materials, originate outside the communities. Purchasing power to buy food, clothing and other goods is more likely to derive from transfer payments than from earned income.

The 11000 residents of the fifteen communities live in some 1300 homes, usually of modest dimension. The homes are usually, (indeed, almost without exception) heated with wood. Each home, on the average, requires about 16 or 17 cords of pine, spruce and poplar each year as heating fuel, for a total of some 22,000 cords. This large fuel requirement reflects the low quality of the housing, and particularly the absence of energy efficiency criteria in their design.

The 1300 homes are provided access to limited electrical service by Manitoba Hydro, a Provincial crown corporation. Service is generally limited to 15 amperes, although 100 ampere service is required elsewhere in the Province. In the remote communities, resistance heaters are specifically prohibited. The 15-ampere services are scarcely adequate to provide lighting, but are stretched, with ingenuity, to provide energy for washing, television, and even cooking and some small power tools.

Schools, nursing homes, hospitals, police and civil administrative offices, and the residences of personnel providing such services, are able to make use of full and unlimited electrical services as required.

Electrical energy is provided in all of the communities by diesel electric generators, operated at very high cost. Limited service to local residents is provided at the rates prevailing in communities served by the main electrical distribution system. The service in the remote communities is, therefore, very heavily subsidized. The rates charged local residents range from about one fifth to less than one tenth the cost of generating and distributing the energy. Public services, whether operated by the Federal or Provincial governments, private institutions, and the few commercial operations present in the communities are charged rates designed to compensate Manitoba Hydro for costs incurred. Payment of such rates, for the most part, represents transfers of public funds from the budget of one government or agency to the coffers of another. Very little tax revenue originates in the communities.

The third significant source of energy in the fifteen communities is heating oil no.2 which is employed to heat schools, nursing stations,

other institutional buildings, and the residences sheltering most of the non-local employees of agencies providing service. Heating oil is expensive. At delivered prices it is as much as twice the price of wood cut locally, seasoned, bucked, split and delivered, and, of course, much more costly than wood produced from the forest by otherwise-unemployed persons for their own use. There is almost no oil used to heat the residences of local people, and some of the socially organized local facilities such as band offices, meeting halls and the like are heated with wood.

A small quantity of propane is used in most of the communities, usually for cooking in nursing stations, or in the residences of teachers or medical personnel. Propane is occasionally used for intermittently operated heaters in locations remote from electrical energy such as pumphouses or construction sites. Propane represents less than one percent of the energy consumed in the fifteen communities.

Oil, used for heating and for generating electrical energy, is the most significant fuel employed, representing some 51 percent of all energy consumed. Some 62 percent of the oil consumed is used to generate electrical energy, and the remaining 38 percent for heating purposes.

Fuel wood, used for heating, and almost exclusively for heating the residences of local people, accounts for about 49 percent of all energy consumed. Propane, and a very small quantity of gasoline and kerosene, account in total, for less than one percent of energy consumption.

1.3.2 Churchill

The town of Churchill does not have a great deal in common with the other fifteen communities. It is an industrial town, a seaport, a minor but significant air and sea transportation centre, and it is located on tundra rather than in northern forest. Its population is somewhat more transient than most northern communities. The population is primarily European in origin and follows a lifestyle more typical of southern cities and towns than does the population of the other fifteen communities. Finally, per capita income is much higher in Churchill than in the other communities.

Churchill is an old community with a varied history. It was founded in the seventeenth century, and until the early twentieth century functioned chiefly as a fur trading depot. It became the terminus of the Hudson's Bay railway in 1931, and became significant as a seaport, airport, defense and research establishment in the ensuing two decades. The community reached a size of some 5,000 during this period, but began to decline in the sixties to the present size of approximately 1,600 permanent residents.

The outlook for the community is somewhat unclear. While it seems unlikely that its present transportation, communication and administrative functions will shrink much further, resource development in the eastern arctic or on Hudson Bay, or defensive or strategic functions could require expansion of the community in future.

Energy sources at Churchill consist of oil and propane, brought in by rail. There is no local source of wood. Almost all homes are heated with

propane as are most commercial and institutional buildings. The exceptions include the port and airport facilities, and a large multipurpose complex, the Town Centre, which use oil. There is a large electrical load in the community, and this is met by diesel electric generation. About 80 percent of energy demand in Churchill is met by oil. About two thirds of the oil is used to generate electrical energy, and the remainder mainly for heating purposes. About 20 percent of all energy consumption is met with propane.

Energy profiles of Churchill and the other fifteen remote communities and opportunities for conservation of imported fuels therein are discussed in detail in the following chapters.

CHAPTER 2

2.0 ENERGY PROFILES FOR THE REMOTE COMMUNITIES

2.1 BACKGROUND

Within the group of sixteen remote communities addressed in this report Churchill has unique characteristics. The remaining fifteen communities exhibit a homogeneity in the nature of the facilities and services available to their residents. The distribution of energy use in Churchill is discussed in Section 2.4. This is preceded by a description of energy use in the remaining remote centres. For the purpose of the latter a typical community is divided into three sectors: the institutional sector, comprising facilities for education, health, police, communication, transport and administration services through various government agencies and corporations; the commercial sector; and, the private or residential sector.

The institutional sector is the largest consumer of imported fuels and, within this, the largest energy users are schools and their related facilities. The schools are administered in the reserve communities by the Department of Indian and Northern Affairs and in non-reserve areas by the provincial Department of Education through the Frontier School Division. Typically the facilities consist of a main school building and several detached classrooms, but in some cases the school is entirely made up of independent single or double classroom units. All buildings are provided with electrical service, usually a minimum of 100 amps and are heated with

oil. Also on the school property and under the jurisdiction of the education authority are the houses provided for the teaching staff, which may include detached single family units, row units, duplexes and trailers. These also have a minimum of 100 amp service and are heated with oil. In some residences there are propane dryers and water heaters, and in a few cases propane is also used for cooking.

Because there is often no community water supply or waste disposal system, the school facilities may include, in addition to the buildings described above, a pumphouse and water line and a sewage treatment facility (e.g. septic tank and field or lagoon). Fuel or electricity is required to operate the pumps and heat the water system.

All heating fuel required for the school facilities is purchased by Indian Affairs or the Frontier School Division and shipped to the community by winter road, rail or air. In communities served by winter roads, these are usually constructed in January or February by the provincial Department of Highways or local bands. The year's supply of fuel and other heavy goods must then be moved in before about the end of March, when the road becomes impassable. If insufficient fuel is delivered by winter road, supplementary shipments can be made by air at much higher cost. For this reason and because of the risk that the winter road will not be built at all, there is usually a minimum of one year's supply of fuel on hand at each school, stored in large outdoor tanks.

In communities served only by air transport, oil is carried in bladders on a DC3, except in Tadoule Lake where it is delivered in drums. Propane is shipped in cylinders containing 45 kg of liquid fuel.

Electricity for the school is supplied by Manitoba Hydro from diesel generators. The diesel fuel is shipped by the same means as the heating oil and stored on-site at the generating station.

The other major institutional facility in a typical remote community is the nursing station, administered by the Medical Services Branch of Health and Welfare Canada or by the Community Services branch of the provincial Health department. The facility usually consists of a single storey nursing station and several trailers for the staff, all heated with oil. In some cases propane is used for cooking, water heating and clothes drying; in others, electricity is used. There may be several other buildings associated with the station, for example, garage, pumphouse, storage shed or boathouse. The station usually has a piped water supply and a sewage treatment facility. In some communities the station is not in full-time use. Fuel is ordered through the health authority and transported by the same means as the shipment to the school.

Among the smaller users of energy in the institutional sector is the RCMP, which is represented by two officers for two or three days a week in a typical community. The facilities usually consist of two trailers; one a residence and one a patrol cabin that contains an office and several holding cells. The trailers are heated with oil, supplemented with kerosene, and there is a propane or electric stove. Because the trailers have running water they must be heated even when unoccupied.

Government-operated transportation facilities in these communities usually consist of airport terminal buildings maintained by the provincial Department of Highways and Transportation and heated with oil. Private

airlines rent space in the terminal buildings. In both Thicket Portage and Pikwitonei there are railway stations and agents' quarters maintained by the CNR.

The communities are served by the Manitoba Telephone System, which maintains an unmanned dial office in each, except for Granville Lake. The equipment is electrically operated and proper temperature is maintained in summer by air conditioning and in winter by supplementary oil or electric baseboard heating. In some cases, the CBC rents space in the MTS building for a television transmitter. In other communities CBC radio and television transmitters are housed separately. These facilities draw electricity but require no space heat beyond the waste heat generated by the equipment.

In several communities there are offices or residences maintained by the provincial Department of Natural Resources for the local conservation officers. In Garden Hill there are also residences and an office for employees of the Federal Atmospheric Environment Service.

Finally in the institutional sector there are facilities which may be considered to be under local jurisdiction. These include street lights and, in a few cases, a water supply. In reserve communities there may be a band office and a band hall, heated with oil and/or wood. The band may also bear the cost of maintaining facilities for local commercial enterprises established with band funds. However, these buildings and the band hall in some communities represent insignificant energy consumption because they are not in regular use.

In the commercial sector the major energy user in a typical northern community is the Hudson's Bay Company store. It is heated with oil as are the residences provided for the manager and staff. In a few communities, there are one or two smaller general stores or a band store. Included in the minor commercial classification, for the purpose of this report, are the small stores, garages, motels, pool halls, mission buildings and churches. In any given community not all of these facilities will be present and some that are present may not be in regular use. As a result, energy consumption in commercial buildings is much smaller than in the institutional sector.

In the residential sector, energy use is closely related to the economic status and general living conditions of the local people, described in Chapter 1. Because of the high cost of oil in these remote areas most homes, other than those residences serving institutional and commercial establishments, are heated with wood, which is usually gathered by the residents as required. The major woods for fuel are jackpine, spruce and trembling aspen.

It appears that other fossil fuels, such as naptha, kerosene and propane, which could serve for cooking and water heating, are not widely used by the local people, probably because of price. Naptha and kerosene may be purchased for use in portable stoves that are taken on hunting and fishing expeditions, and propane is probably used for cooking in a few homes. In houses without electrical service, cooking and water heating are done on the wood stove. Where electricity is available, an electric rangette is usually used for these tasks. Because in most communities

there is no residential piped water service, it is unusual to find an electrically heated water tank but electric clothes washers appear to be in more common use.

Other electrical appliances in a typical house include a kettle, toaster, refrigerator, and perhaps a television or a stereo. However, because the standard residential connection in a community with diesel-generated power is 15 amps, only two or three of these appliances, plus lights, can be operated at the same time. As a result, electricity consumption in a typical northern house is substantially lower than in a house with a 100 amp connection, the standard service in other communities.

2.2 ENERGY PROFILE FORMAT

An energy profile for each community is included in Chapters 4 through 18 of this report. Identified community components having an energy demand are outlined in Tables 4.1, 5.1 ... , and 18.1. Not forming part of the tables and not considered in this study are fuels, lubricants and demand associated with moving vehicles such as automobiles, trucks, snowmobiles, airplanes, and locomotives, as well as energy consumption directly associated with construction activities, which tend to be intermittent and intensive. The facilities described in Tables 4.1, 5.1 ... , 18.1 are those which existed or were surmised to exist through the early and middle parts of 1982, the information presented having been culled from documentation contributed by the central institutional authorities and recent general community profiles prepared by the federal and provincial governments, and from file data, conversations with individuals familiar with the

communities, and observations made during October 1982, visits to two of the sites.

Profiles of energy use by the various institutional, commercial, and residential groups for the identified facilities are shown in Tables 4.2, 5.2 ... , 18.2 and Tables 4.3, 5.3 ... , 18.3, divided into four end-use types: electricity, fuel oil, propane, and wood. A small part of the electrical energy consumption in the typical community is electrical space heating at some telephone exchanges, transmitter stations, and at one railway station, probably representing most of the consumption of these facilities. Facilities with electric heating are noted in Tables 4.1, 5.1 ... , 18.1.

The fuel oil category refers almost exclusively to space heating, any other uses being insignificant compared to the total. What limited amounts of propane are consumed are largely for the support of domestic activities in institutional service residences, but propane is also used for pumphouse heating in some communities. Wood serves primarily as a residential space-heating fuel with the reported consumption including some cooking and water heating.

As a consequence of the quality of the available information and the uncertainty regarding both the past and future nature of the energy-related characteristics of each community, the annual energy profiles shown in Tables 4.2, 5.2 ... , 18.2 and Tables 4.3, 5.3 ... , 18.3, are based on the facilities present in 1982. Entries in the tables are derived from figures obtained from the various institutional authorities, the Hudson's Bay

Company, Manitoba Hydro, carriers handling fuel shipments to the communities, and other provincial and federal government departments.

Annual records for the most recent years are incomplete for certain user groups, and, in several cases, unavailable. Some figures are reported on a fiscal year basis, while some institutions compile data for calendar years only. For certain institutions, the quantities of oil and propane imported, rather than the quantities actually consumed, comprise the available data. It also appears that the propane deliveries are not as rigourously recorded as oil deliveries in many cases, probably because of their relatively minor volume. In addition some records appear to be contradictory between sources.

Missing data have been estimated for the particular facilities described in Tables 4.1, 5.1, ... , 18.1 through comparisons with similar facilities for which quantitative information was available and allowing for annual heating-degree-day differences over the geographical region covered by the study. Assumptions applied in the production of the estimates are shown in Tables 2.1 and 2.2 for the various fuels and communities.

The space-heating loads for typical residences, given in Table 2.2, were determined using some locally volunteered observations and heating-degree-day values for each site, and assuming all houses were in similar condition. For counting purposes in the preparation of the energy profiles, these values were used for all single detached non-service residences and other small, heated single-storey frame buildings with floor areas in the range 45 m^2 to 85 m^2. The number of residential units in each

TABLE 2.1

FUEL-SPECIFIC ASSUMPTIONS USED IN ENERGY CALCULATIONS

Fuel	Energy Content	Space Heating Efficiency	Electrical Generation Efficiency
Fuel Oil	3.87×10^7 J/l	60%	depends on community; range: 1.20 - 2.89 kWh/litre (see Table 2.2)
Propane - liquid	2.72×10^7 J/l	65%	not applicable
Propane - gas	9.42×10^7 J/m³	65%	not applicable
Wood	1.58×10^{10} J/cord[1]	55%	not applicable

1. Basis: air-dried spruce, pine, poplar.

TABLE 2.2

COMMUNITY - SPECIFIC ASSUMPTIONS USED IN ENERGY CALCULATIONS

Community	Annual heating degree-days below 18°C	Annual space-heating fuel consumption for typical non-service residence (cords of wood)	Annual diesel generation efficiency (kWh/l)
Brochet	7900	16.7	2.55
Garden Hill	7200	15.2	2.75
God's Lake Narrows	7800	16.5	2.60
God's River	7900	16.7	2.05
Granville Lake	7500	15.9	1.20
Lac Brochet	8200	17.4	2.00[1]
Oxford House	7700	16.3	2.82
Pikwitonei	7900	16.7	2.14
Pukatawagan	7300	15.5	1.96
Red Sucker Lake	7800	16.5	2.60
St. Theresa Point	7200	15.2	2.47
Shamattawa	8500	18.0	2.28
Tadoule Lake	9100	19.3	2.00[1]
Thicket Portage	7900	16.7	2.33
Waasagomach	7200	15.2	2.54
Churchill	9200	-	2.89

1 Estimated because of insufficient historical data.

community was assumed to be the number of residential electricity customers in early 1982, which generally includes several houses normally connected only in the winter. In many communities most of the houses are taken into account by this means, but it is known that significant numbers of houses in some communities (notably Tadoule Lake and Lac Brochet, where a central electrical service is a recent innovation) have not yet been connected to the electricity supply system. The total for Pukatawagan includes twenty-four houses not serviced with electricity; the number of residences in Lac Brochet is assumed to be the number of residential electrical customers in 1982; the number of houses assumed for Tadoule Lake is estimated on the basis of 1982 population. All non-service houses with residential electric connections were assumed to be wood-heated, because exceptions appear to be rare.

The types of heating fuel (oil or wood or both) assumed to be used in band or community offices and halls, and in local enterprises, if not known, were chosen on the basis of the general level of facilities available in the particular communities and on the building descriptions, with small stores and band or community offices normally being considered to be oil-heated and halls to be wood-and-oil heated.

A restatement of the data in Tables 4.2, 5.2 ... , 18.2 in common units is provided as Tables 4.3, 5.3 ... , 18.3 in order to facilitate comparison among the user groups, energy categories, and communities. All entries are strictly conversions from corresponding values in the associated Tables 4.2, 5.2, ... , 18.2 and no increase in accuracy is implied. Due to rounding, columns may not sum to totals.

Fuel oil equivalents for generation of electrical energy were calculated for each community on the basis of the average of the observed annual average diesel efficiencies for the operating year 1981/82 and all previous years in which the same configuration of generating equipment was in place. These values as well as the energy equivalents employed in the conversions are shown in Tables 2.1 and 2.2.

2.3 ENERGY USE IN THE REMOTE COMMUNITIES

Summaries of the estimated energy consumption patterns in the group of fifteen remote communities are given in Table 2.3, 2.4, 2.5, and 2.6. In Table 2.3 are shown breakdowns of the total consumption into source fuel categories. Tables 2.4, 2.5, and 2.6, illustrate, respectively, the distributions of total energy, electricity, and heating oil and wood consumption in terms of community end-use sectors. While the magnitudes vary among the communities and their proportions reflect the sizes of the various population centres, the most striking feature of the results shown is the consistency of the distributions of energy consumption among use sectors and fuel types from community to community within the group. This could be expected since the economic base is similar in each location and facilities controlled from outside in each community are similar and are operated by common institutional and commercial organizations (e.g., the educational, health, policing, communications, and air or rail transport authorities, and the Hudson's Bay Company).

In terms of the fuels delivered to each site, Table 2.4 indicates that, on average, 32.8 percent of the total is used by the institutions,

TABLE 2.3

ENERGY PROFILE SUMMARY - DISTRIBUTION BY SOURCES: TOTAL COMMUNITY ENERGY CONSUMPTION

Community	Annual Source Fuel Consumption[1]								
	Fuel Oil								
	Electricity	Space Heating	Total		Propane		Wood		All Fuels
	(GJ)	(GJ)	(GJ)	(%)	(GJ)	(%)	(GJ)	(%)	(GJ)
Brochet	14509	11223	25732	57.7	128	0.3	18723	42.0	44583
Garden Hill	44723	24226	68949	51.1	150	0.1	65681	48.7	134780
God's Lake Narrows	26182	16138	42320	51.2	122	0.1	40164	48.6	82606
God's River	7230	2593	9823	47.4	65	0.3	10823	52.3	20711
Granville Lake	1742	890	2632	46.3	30	0.5	3018	53.1	5680
Lac Brochet	5225	3638	8863	57.8	158	1.0	6304	41.1	15325
Oxford House	23028	15712	38740	45.4	-	-	46610	54.6	85350
Pikwitonei	6691	4799	11490	52.6	52	0.2	10302	47.2	21844
Pukatawagan	18935	7817	26752	55.5	163	0.3	21330	44.2	48245
Red Sucker Lake	8216	5457	13673	49.1	76	0.3	14094	50.6	27843
St. Theresa Point	28782	16525	45307	49.1	114	0.1	46815	50.8	92236
Shamattawa	9726	6308	16034	44.6	169	0.5	19766	55.0	35969
Tadoule Lake	3735	2670	6405	43.6	190	1.3	8090	55.1	14685
Thicket Portage	6644	5728	12372	56.0	92	0.4	9638	43.6	22102
Waasagomach	17384	10991	28375	56.1	98	0.2	22088	43.7	50561
15 Community Total	222752	134715	357467	50.9	1607	0.2	343446	48.9	702520
Percent of Consumption	31.7	19.2	50.9		0.2		48.9		100.0
Churchill	307779	119660	427439	78.5	117205	21.5	-	-	544644
Percent of Consumption	56.5	22.0	78.5		21.5		-		100.0

1 Values are total energy content of source fuel consumption (1 GJ=10^9 J). Energy content and efficiency assumptions used in calculations are shown in Tables 2.1 and 2.2. Percentages may not sum to 100.0 due to rounding.

TABLE 2.4

ENERGY PROFILE SUMMARY - DISTRIBUTION BY SECTORS: TOTAL COMMUNITY ENERGY CONSUMPTION

Community	Annual Energy Consumption - Source Fuel Equivalent[1]								
	Institutional		Commercial		Industrial		Residential		Total
	(GJ)	(%)	(GJ)	(%)	(GJ)	(%)	(GJ)	(%)	(GJ)
Brochet	18438	41.4	3299	7.4	-	-	22846	51.2	44583
Garden Hill	43414	32.2	7489	5.6	-	-	83879	62.2	134780
God's Lake Narrows	25908	31.4	6264	7.6	-	-	50432	61.1	82606
God's River	6339	30.6	690	3.3	-	-	13684	66.1	20711
Granville Lake	2012	35.4	700	12.3	-	-	2969	52.3	5680
Lac Brochet	7527	49.1	1062	6.9	-	-	6735	44.0	15325
Oxford House	24038	28.2	5297	6.2	-	-	56013	65.6	85350
Pikwitonei	7331	33.6	1098	5.0	-	-	13415	61.4	21844
Pukatawagan	18156	37.6	3283	6.8	-	-	26807	55.6	48245
Red Sucker Lake	7784	28.0	2142	7.7	-	-	17918	64.4	27843
St. Theresa Point	26581	28.8	4809	5.2	-	-	60846	66.0	92236
Shamattawa	9838	27.4	2867	8.0	-	-	23264	64.7	35969
Tadoule Lake	4761	32.4	1132	7.7	-	-	8792	59.9	14685
Thicket Portage	9086	41.1	1503	6.8	-	-	11515	52.1	22102
Waasagomach	19136	37.8	3542	7.0	-	-	27883	55.1	50561
15 Community Total	230349	32.8	45177	6.4	-	-	426998	60.8	702520
Churchill	220918	40.6	44490	8.2	75314	13.8	203922	37.4	544644

1 Values are total energy content of source fuel consumption (1 GJ = 10^9 J). Energy content and efficiency assumptions used in calculations are shown in Tables 2.1 and 2.2. Rows may not sum to totals due to rounding.

TABLE 2.6

ENERGY PROFILE SUMMARY - DISTRIBUTION BY SECTORS: COMMUNITY ELECTRICAL ENERGY CONSUMPTION

Community	Annual Electrical Energy Consumption - Source Fuel Equivalent[1]								
	Institutional		Commercial		Industrial		Residential		Total
	(GJ)	(%)	(GJ)	(%)	(GJ)	(%)	(GJ)	(%)	(GJ)
Brochet	8286	57.1	1578	10.9	-	-	4644	32.0	14509
Garden Hill	20604	46.1	3884	8.7	-	-	20237	45.2	44723
God's Lake Narrows	11624	44.4	3230	12.3	-	-	11327	43.3	26182
God's River	3644	50.4	189	2.6	-	-	3398	47.0	7230
Granville Lake	839	48.2	194	11.1	-	-	710	40.8	1742
Lac Brochet	3966	75.9	290	5.6	-	-	968	18.5	5225
Oxford House	9660	41.9	2937	12.8	-	-	10430	45.3	23028
Pikwitonei	2984	44.6	326	4.9	-	-	3382	50.5	6691
Pukatawagan	10425	55.1	2527	13.3	-	-	5983	31.6	18935
Red Sucker Lake	3528	42.9	596	7.3	-	-	4093	49.8	8216
St. Theresa Point	10513	36.5	3290	11.4	-	-	14979	52.0	28782
Shamattawa	4176	42.9	1341	13.8	-	-	4209	43.3	9726
Tadoule Lake	2283	61.1	290	7.8	-	-	1161	31.1	3735
Thicket Portage	3838	57.8	266	4.0	-	-	2541	38.2	6644
Wasagamack	9126	52.5	1752	10.1	-	-	6506	37.4	17384
16 Community Total	105496	47.4	22690	10.2	-	-	94568	42.5	222752
Churchill	110529	35.9	26728	8.7	50685	16.6	119836	38.9	307779

1 Values are total energy content of fuel consumed to generate electrical energy (1 GJ = 10^9 J). Energy content and efficiency assumptions used in calculations are shown in Tables 2.1 and 2.2. Rows may not sum to totals due to rounding.

TABLE 2.6

ENERGY PROFILE SUMMARY - DISTRIBUTION BY SECTORS:
COMMUNITY CONSUMPTION OF WOOD AND HEATING OIL

Community	Annual Fuel Consumption (GJ)[1]							
	Institutional		Commercial		Industrial		Residential	
	Oil	Wood	Oil	Wood	Oil	Wood	Oil	Wood
Brochet	10024	-	1200	521	-	-	-	18202
Garden Hill	22061	600	2167	1438	-	-	-	63642
God's Lake Narrows	13893	269	2244	790	-	-	-	39105
God's River	2361	269	232	269	-	-	-	10286
Granville Lake	890	253	-	506	-	-	-	2259
Lac Brochet	3134	269	503	269	-	-	-	5767
Oxford House	14125	253	1586	774	-	-	-	45583
Pikwitonei	4295	-	503	269	-	-	-	10033
Pukatawagan	7315	253	503	253	-	-	-	20824
Red Sucker Lake	4180	-	1277	269	-	-	-	13825
St. Theresa Point	15480	474	1045	474	-	-	-	45867
Shamattawa	5069	427	1239	284	-	-	-	19055
Tadoule Lake	2129	158	542	300	-	-	-	7631
Thicket Portage	4760	395	968	269	-	-	-	8974
Waasagomach	9675	237	1316	474	-	-	-	21377
15 Community Total	119391	3857	15325	7159	-	-	-	332430
Percent in Sector	88.6	1.1	11.4	2.1	-	-	-	96.8
Churchill	93770	-	-	-	21827	-	4064	-
Percent in Sector	78.4	-	-	-	18.2	-	3.4	-

1 Values are total energy content of fuel consumed (1 GJ = 10^9 J). Energy content and efficiency assumptions used in calculations are shown in Tables 2.1 and 2.2.

while 6.4 percent is attributable to the commercial sector, and 60.8 percent of the total energy is consumed in the non-service residences. The consumption of fuel oil for generation of electricity for the institutional sector, as shown in Table 2.5, is slightly higher than that for the residential group, 47.4 percent as compared to 42.5 percent of the total, on the average, with the remaining amount being used for the production of electricity for stores, businesses, and churches.

The consumption of energy as fuel wood, which, besides heating, includes some cooking and water heating in the residential sector and in some minor commercial and community buildings, is approximately two and a half times that of heating oil consumption, 48.9 percent versus 19.2 percent of the total, as shown in Table 2.3. Approximately 88.6 percent of the heating oil, as indicated in Table 2.6, is used in the institutional facilities. The use of propane is insignificant compared to that of either wood or heating oil, its applications limited primarily to cooking, clothes drying and water heating.

The energy profiles clearly indicate that institutions are the predominant users of imported non-renewable fuels in the fifteen communities. The implementation of space-heating fuel oil conservation measures within individual facilities would therefore involve only the facilities of the relatively small number of institutions operating in a community. Complete conversion of the institutional and commercial space heating would represent approximately 38 percent of the total fuel oil used in the average community. The remaining 62 percent of imported fuel oil is used to generate electricity. Opportunities for reducing this demand by

conservation of electricity are marginal while practically the entire demand would be eliminated by conversion to an alternative electrical generation source. Conservation and conversion alternatives are discussed in Chapter 3 of this report.

2.4 CHURCHILL: ENERGY SOURCES, SUPPLIES, AND CONSUMPTION

Consumption of fossil fuels in Churchill is similar to consumption patterns in other remote communities in two ways: the community as a whole is dependent on diesel-generated electric power and major institutional buildings are dependent on imported fuels for space heating. However, in addition to these loads and in contrast with the less developed communities Churchill has a substantial industrial, commercial, and residential space-heating load which cannot be met from locally available fuels. This load is met to some extent by oil and electricity but chiefly by propane.

The second factor which distinguishes Churchill from the other fifteen communities is a much higher per capita consumption of energy, the result of a higher living standard and greater economic activity. A description of existing facilities in Churchill is given in Table 19.1. The supply and uses of each fuel are discussed in the paragraphs that follow and quantities consumed are shown in Tables 19.2 and 19.3.

Fuel oil is shipped to Churchill in railway tank cars and distributed by two bulk dealers, Shell and Imperial. It is used for space heating at the harbour, the airport and the Town Centre, in some commercial buildings, in about twenty residences, and to heat the water for the municipal water distribution system. Oil is also used indirectly by the only manufacturing

enterprise in Churchill, a company that makes feed pellets from waste grain using steam purchased from the heating plant at the harbour.

Because of uncertainty in figures of quantities freighted to and through Churchill, it is difficult to estimate total fuel oil sales in the town, but consumption by the four major users combined (the harbour, the airport, the Town Centre and the local government district), is over 3 million litres per year.

Propane is also shipped by rail in liquid form and approximately 4.3 million litres (equivalent to 1.2 million cubic metres of gas) are distributed by Steelgas Utilities annually. It is used as an auxiliary heating fuel for outlying buildings at the harbour and the airport and as the primary fuel in the elementary school, the CN station and many smaller institutional and commercial buildings. These loads add up to about 1.4 million litres per year, or a little under one third of total 1981 propane deliveries.

The remaining propane sales are to residential customers, the majority of them tenants of government-sponsored housing managed by the Churchill Housing Authority. The CHA owns a propane distribution system that serves almost all its properties and several buildings managed by the Churchill Health Centre, i.e., 7 apartment buildings containing a total of 133 suites, and approximately 200 houses. Eight other CHA houses use bulk propane and one other apartment building (20 suites) is electrically heated. Stoves, water heaters and all other appliances are electric. In 1981, Steelgas distributed a total of 2.9 million litres of liquid propane

for residential use, 2.6 million litres to the Housing Authority and the remainder to private customers with individual storage tanks.

The third major source of energy in Churchill is electricity. Total consumption in 1980-81 was nearly 23 million kWh and in 1981-82 was over 22 million kWh, which represents, on the basis of the reported efficiency for each of those years, about 8 million litres of diesel fuel annually at the generating stations.

Of the total electrical consumption, nearly half (about 10 million kWh in 1980-81) is by six major users, all with large mechanical loads: the harbour, the airport, the Town Centre including the hospital, the municipal water and sewage treatment plants, the NRC station, and the Arctic Grain feed-pellet factory. The largest single load is the harbour facilities, which draw an average of 500,000 kWh per month during the shipping season (August to October). Voltage fluctuations in the electric distribution network resulting from the intermittent operation of the grain cleaning and dock equipment in these months are reduced by the use of mobile generating units (3000 kW total) located near the harbour. Two much smaller mechanical loads are the telephone and television transmission facilities.

The other half of the electrical load in Churchill consists of lights and appliances in government, commercial and residential buildings and space heating in about 50 houses and one apartment building.

A breakdown of electricity consumption by customer is given in Tables 19.2 and 19.3 along with corresponding figures for fuel oil and propane. Summaries appear in Tables 2.3, 2.4, 2.5 and 2.6.

The differences between Churchill and the other remote communities, as discussed above, are evident in the energy-profile summary tables. Propane and fuel oil are of approximately equal importance in terms of their being utilized as sources of space heating energy, but the consumption of fuel oil is concentrated at three large facilities while a variety of institutions, commercial establishments, and residential units use propane. Electric heating is used in some houses and offices, but fuel wood is not produced locally and is not used as an energy source.

Approximately 16.5 percent of the electrical energy, and 18.2 percent of the fuel oil consumed in the community, or 13.8 percent of the total energy used, is directly attributable to industrial activity. This is in sharp contrast to the other fifteen northern communities examined in the study, which lack an industrial sector. In general, the role of Churchill as an administrative centre and transportation node along with the residual effects of its tenure as a defense and research station contribute to the current levels of energy consumption in all sectors.

Because of the higher per capita income, average occupancy levels for both residential and non-residential buildings are considerably lower than in the other remote communities and expectations of degrees of comfort and convenience are higher. It may be that the current level of electrical energy demand can be slightly reduced through an increase in consumer awareness, but more effective fossil-fuel energy conservation options may include those which would involve changes in facility management practices, the decommissioning of underutilized buildings, and the substitution of

space-heating modes. Possible energy conservation alternatives for Churchill are discussed further in Section 3.

2.5 COSTS OF ENERGY IN THE REMOTE COMMUNITIES

2.5.1 Oil Costs

It is useful, for the purpose of analyzing energy consumption, to make a distinction between fuel oil that is used for space-heating and oil that is used in diesel machinery. In fact, however, the two fuels are almost identical in chemical properties and in price, since neither is taxable as a motive fuel, so they can be treated as a single commodity.

The costs shown in Table 2.7, which include haulage and administration costs, were for bulk shipment of diesel fuel to Manitoba Hydro sites in the winter of 1981-82. All costs are as quoted by Manitoba Hydro except those for Churchill, Lac Brochet and Granville Lake, which were estimated from earlier records. Given that administration costs are less than $0.01 per litre and that the Winnipeg base price was between $0.24 and $0.27 per litre over the purchasing period, these figures indicate that transport costs range from about $0.035/litre at Pukatawagan to about $0.26/litre at Tadoule Lake. In other words transportation costs add about 20% to the Winnipeg price of bulk fuel in communities on the railroad, about 25 percent in places served by winter road and up to 100% in places where fuel is shipped by air.

In most communities, the only user comparable to Manitoba Hydro in terms of volume of oil consumed is the educational authority, which

heats both its school buildings and residences. This fuel is usually delivered by the same means as the Hydro supplies and at a comparable price, as indicated in the footnotes to Table 2.7.

Smaller users, on the other hand, pay significantly higher per-litre prices than Hydro because they cannot purchase or ship in bulk. For instance, because of the amount required, the Winnipeg price of heating oil ordered for the federal nursing stations was $0.04 per litre higher than the price of the oil purchased for federal schools in the same season. Prices to customers who have no business contacts outside the community are even higher and can vary from one shipment to another. In Shamattawa, for example, in the fall of 1982, a price of $0.77/l for fuel delivered by air was quoted by the Indian Band, as compared with a $0.48/l cost calculated by Hydro for its annual shipment. The differences in cost to private and industrial customers are probably not this large in all communities, particularly those that are served by ground transport, but it is safe to assume that the Manitoba Hydro and Department of Indian and Northern Affairs costs quoted in Table 2.7 represent the lowest prices paid by oil users in each community.

2.5.2 Propane Costs

Table 2.8 shows delivered costs of liquid propane in 1981-82. In Churchill the propane is brought in by rail tankcar and delivered by tanker at a cost of $0.25 per litre to commercial customers and $0.26 per litre residential customers. In all the other communities except Tadoule Lake, where a small bulk delivery was made in 1981-82, propane for institutional

TABLE 2.7

PRICES FOR BULK FUEL OIL SHIPPED IN 1981-82

Community	Unit Prices[1] Litre	GJ	Method of Transport
Brochet[2]	$0.37	$15.93	barge inoperable, air transport substituted, possible winter trail shipment in 1983.
Garden Hill	0.32	13.78	winter road
God's Lake Narrows	0.34	14.64	winter road
God's River[3]	0.41	17.66	winter road
Granville Lake	0.39	16.80	winter road
Lac Brochet[2]	0.44	18.95	air
Oxford House	0.32	13.78	winter road
Pikwitonei[2]	0.29	12.49	rail
Pukatawagan	0.29	12.49	rail and road
Red Sucker Lake	0.36	15.50	winter road
St. Theresa Point	0.32	13.78	winter road
Shamattawa[4]	0.48	20.67	air
Tadoule Lake[5]	0.55	23.69	air
Thicket Portage[2]	0.29	12.49	rail
Waasagomach	0.32	13.78	winter road
Churchill	0.34	14.64	rail

1 Cost to Manitoba Hydro; base cost at Winnipeg is $0.244/l in most cases; total per-litre costs reported by the Department of Indian and Northern Affairs for the same period are within $0.02/l, except as noted. Price per GJ of delivered energy is equal to price per litre divided by (0.0387 x 0.60), based on conversion assumptions for fuel oil shown in Table 2.1.

2 No DINA price available.

3 DINA price $0.05/l lower because cost of winter road construction not included.

4 DINA price $0.60/l.

5 DINA price $0.59/l, air transport.

TABLE 2.8

PRICES FOR PROPANE - 1981-82

Community	Unit Prices[1] Litre	GJ	Method of Transport
Brochet[2]	$0.80	$45.25	air
Garden Hill	0.32	18.10	winter road
God's Lake Narrows	0.32	18.10	winter road
God's River	0.32	18.10	winter road
Granville Lake[2]	0.80	45.25	air
Lac Brochet[2]	0.90	50.90	air
Oxford House	0.32	18.10	winter road
Pikwitonei[2]	0.60	33.94	rail
Pukatawagan	0.68	38.46	rail and road, some air
Red Sucker Lake	0.32	18.10	winter road
St. Theresa Point	0.32	18.10	winter road
Shamattawa	1.10	62.22	air
Tadoule Lake	1.00	56.56	air
Thicket Portage[2]	0.60	33.94	rail
Waasagomach	0.32	18.10	winter road
Churchill[3]	0.26	14.71	rail

1 costs to Department of Indian and Northern Affairs, except as noted; based on purchase and transport of fuel in cylinders. Price per GJ of delivered energy is equal to price per litre divided by (0.0272 x 0.65), based on conversion assumptions for liquid propane shown in Table 2.1.

2 estimated cost; based on purchase and transport of fuel in cylinders.

3 retail price charged by Steelgas, 1982; based on purchase and transport of fuel in bulk.

use is delivered in metal cylinders which hold 45 kilograms (89 litres) of liquid. Residential and commercial users purchase cylinders of this size or smaller 9 kg containers. The unit cost of propane is consistently higher for these private customers than for the schools or the nursing stations and, as a result, private use of propane is minimal in all communities except Churchill.

Because of the difficulty of transporting these cylinders, per-litre haulage costs are higher than for oil and make up at least one third of the delivered cost of the fuel. The prices shown in Table 2.8 for winter road are based on costs reported by Indian Affairs for 1981-82: $19.95 per cylinder in Winnipeg and $0.11/kilogram transport costs on a cylinder weighting about 82 kg when full.

Costs for Pukatawagan, Shamattawa and Tadoule Lake are based on figures for volumes of liquid and total costs reported by Indian Affairs in Thompson. Although some propane is transported at a contracted price, the cost for any given shipment may depend on whether the plane or rail car is full, and what other goods are being transported. Consequently the calculated per-litre price represents an average cost over the year rather than an established contract price. Bulk propane costs shown for other communities are estimates.

2.5.3 Electricity Rates

Electricity rates charged by Manitoba Hydro in a community with diesel-generated power fall into two categories: those rates that are set by the provincial Public Utilities Board and are the same as in other rural

areas and those that are established annually by Manitoba Hydro for each community on the basis of capital and operating (including fuel) costs at a site and apply only in that community. The regulated residential rates are charged to customers with a connection below the service limitation, which is 100 amps in Churchill and 15 amps in other communities, while the cost-related rates apply to all customers with a connection above this limit. For commercial connections, the service limitation is 30 amps in all communities except Churchill (100 amps) and customers at or below this limit are charged at the regulated rate.

The purpose of regulation is to protect private customers in remote areas from paying the full cost of diesel-generated power, which can be over one dollar per kWh, by setting their rates equal to the highest price charged to residential and commercial customers who are on the central grid system. These customers pay approximately $0.05 per kWh for the first block of energy and a lower rate for the balance, as shown in Table 2.9.

All other customers, including the school, the nursing station, other government facilities, large commercial enterprises, and, in some communities, the Indian Band, are charged the higher cost-related prices for electricity shown in Table 2.10. The rate paid by the individual customer within this group depends on the type of contract originally made with Manitoba Hydro. This may be:

> The Full Cost Contribution Paid Rate, which is essentially the projected average cost of providing a kilowatt hour of electricity in that year, reduced by a credit calculated annually on the value of capital contributions paid by the consumer in advance of

receiving service, and then plus or minus the average profit/loss experienced in the preceding year per kWh sold in the community.

The Full Cost No Contribution Paid Rate, which again is essentially the projected average cost of providing a kilowatt hour of electricity in that year. The rate is not reduced by an automatic annual credit in this instance, reflecting the fact that the customer did not initially pay a lump-sum contribution in order to receive service. The "make-up" factor or variance factor is then added or subtracted to account for the profit or loss on the previous year's operations, as is done for the Contribution Paid Rate.

The Diesel General Service Government of Canada Contract Rate which falls slightly short of equalling the average cost of providing a unit of electricity. The rate cannot be adjusted to the full-cost level since the contracts stipulate that the only cost factor with which the Government of Canada rate can rise is fuel price and haulage.

By July 1st, 1977, the Government of Canada service classification and the No Contribution Paid service classification had been declared closed rates, under which no new connections would be accepted. Over the fiscal year 1977/'78, customer service classifications were reviewed and customers were transferred to the correct service category and rate if service classification errors were brought to light. This occurred whether or not the service classification was now closed, although no new services were allowed under either of the two closed rates.

The contracts which established the Government of Canada rates have expired in most communities and will soon do so in others with the result that eventually all federal government connections will be charged at the Contribution Paid rates. Thus the rate structure of any given community is gradually being pared down from a multiple rate structure to one consisting of three basic rates for service: a rate for limited 15 amp residential service; a rate for limited 30 amp general purpose service; and

a full cost rate for all services in excess of service limitation, regardless of the type of premises (commercial, residential, institutional, private or government) served.

TABLE 2.9

ELECTRICITY RATES IN 1982 - PUBLIC UTILITIES BOARD

Customer	Rate
Residential	$0.05/kWh for first 250 kWh $0.0253/kWh for balance
Electric Heat	same as residential (available in Churchill only)
Commercial	$0.049/kWh for first 1200 kWh $0.0297/kWh for balance

Taxes: 5 percent residential and commercial customers, except for status Indians; 1 percent for electric heat customers.

Service Charges: $8/month for residential and electric heat customers, $11/month for commercial customers.

TABLE 2.10

ELECTRICITY RATES IN 1982 - MANITOBA HYDRO

Community	Unit Price[1]					
	No Contribution		Contrib. Paid		Fed. Gov't	
	kWh	GJ	kWh	GJ	kWh	GJ
Brochet	$0.337	$ 93.61	$0.332	$ 92.22	-	-
Garden Hill	0.267	74.17	0.218	60.56	-	-
God's Lake Narrows	0.255	70.83	0.210	58.33	-	-
God's River	0.478	132.78	0.347	96.39	0.202	56.11
Granville Lake	-	-	1.309	363.61	0.315	87.50
Lac Brochet	-	-	1.070	297.22	-	-
Oxford House	0.225	62.50	0.214	59.44	-	-
Pikwitonei	0.420	116.67	0.420	116.67	-	-
Pukatawagan	0.351	97.50	0.269	74.72	-	-
Red Sucker Lake	0.333	92.50	0.249	69.17	0.232	64.44
St. Theresa Point	0.267	74.17	0.218	60.56	-	-
Shamattawa	0.608	168.89	0.550	152.78	0.272	75.56
Tadoule Lake	-	-	0.851	236.39	-	-
Thicket Portage	0.318	88.33	0.289	80.28	-	-
Waasagomach	0.267	74.17	0.218	60.56	-	-
Churchill	-	-	0.168	46.67	-	-

Service charge: $11/month on all connections.

1. Price per GJ of delivered energy is equal to price per kWh x 2.778 x 10^2 kWh/GJ (100% efficiency assumed).

2.5.4 Cost of Fuel Wood

Spruce, jackpine, and poplar stands in the vicinity of all communities except Churchill are the sources of the fuel wood currently consumed, which is mostly for residential space heating. Smaller quantities of birch, fir, and other varieties may also be found. The accessibility and extent of areas of jackpine growth result in this wood being the most commonly used type. Wood gathering is largely unorganized with residents cutting from burn areas or collecting driftwood as required. The Manitoba Department of Northern Affairs has a fuel-wood stockpiling program in the non-reserve communities.

Fuel-wood prices are relatively consistent across the range of communities examined in this study, according to local estimates. The average 1982 price in member communities of the Keewatin Tribal Council, which includes Brochet, Lac Brochet, Shamattawa, Tadoule Lake, God's Lake Narrows, God's River and Oxford House has been estimated at $70 to $75 per cord, delivered in 2.4-metre (i.e. 8-foot) lengths. Local officials at Shamattawa and at Brochet have reported prices of $80 per cord. Prices in the Island Lake area may be slightly lower. A price of $80 per cord is equivalent to $9.21 per GJ of delivered energy, based on the conversion assumptions shown in Table 2.1.

CHAPTER 3

3.0 NATURE AND SCALE OF CONSERVATION OPPORTUNITIES

3.1 SUMMARY OF TOPICS

Four major energy conservation opportunities present themselves in the sixteen communities:

1. Replacement with fuel wood of some 3,500,000 litres per year of heating oil used to heat public institutional and commercial buildings in the fifteen remote communities.

2. Reduction, by several thousand cords per year, of the quantity of fuel wood used to heat existing residential buildings, and reduction of future fuel-wood requirements for new buildings through improved design and better construction of housing.

3. Replacement of all, or most, of some 13,800,000 litres per year of fuel oil used to generate electrical energy, by means of harnessing hydro-electric generating opportunities near existing communities, and/or by means of interconnection with the main Manitoba Hydro grid.

4. Replacement of some 3,100,000 litres per year of fuel oil used for heating in Churchill with either propane gas or electric heating, depending upon the outcome of certain studies and negotiations.

Discussion of each of the above follow.

3.2 REPLACING HEATING OIL IN REMOTE COMMUNITIES

In the fifteen remote communities oil yielding 135,000 Gigajoules per year is burned to heat schools, nursing stations, other public buildings, small businesses, and the residences of non-local persons employed in providing public services. This quantity of oil, equal to approximately 21,900 standard bbls, (about 3,500,000 litres), yields <u>delivered energy</u>,

when burned, equal to combustion of about 9,300 cords of seasoned pine, poplar or spruce. (By comparison, local residents in these communities consume about 22,000 cords per year to heat their homes and a few other buildings.) The opportunity exists to convert the institutional heating load in these communities from oil to wood. There would be attendant savings in costs and there would be significant employment benefits in the communities.

Some buildings could easily be retrofitted with wood-burning devices; in other cases retrofitting would be fairly difficult and expensive. In every case conversion from oil to wood would require physical retrofitting of plant, provision of a reliable wood supply, and organization of a reliable firing service, either by personnel presently using the facility, or by personnel retained for the purpose. The operation and maintenance of wood-burning space heaters, furnaces, or boilers as replacements for oil-burning units would require, in addition, an increase in knowledge and care, maintenance, and, notably, a continuing standard of effort because fire protection capabilities in the remote communities in general provide less security against losses than do those in other centres.

Typical costs for both fuels (oil and wood) in 1982 are shown in Section 2.5. The variation in oil prices among the communities is primarily due to shipping costs which reflect remoteness and modes of transport from supply centres. Unit prices for individual contract shipments to a community vary slightly, with advantage to volume purchasers, as could be expected. Significant decreases in total oil importation to a community, resulting from conservation efforts, or for any other reason, could be

expected to discourage and decrease the efficiency of the carriers, with a consequent increase in unit shipping charges.

Fuel-wood price estimates among the communities range from $70 to $80 per cord. Methods of supply exhibit no discernible pattern and include examples of unorganized cutting and gathering from burn areas, collection of driftwood, and, in some cases, stockpiling in preparation for the heating season. It appears that adequate supplies for each community except Churchill could be maintained from local sources by organized operations, particularly as the increased amount of wood required for space heating of buildings currently fitted with oil-burning equipment is relatively small compared to the estimated current wood consumption. Careful management of the forest resources would be particularly important at both Shamattawa and Tadoule Lake, however, since they lie on the northern fringes of extensive tree cover. In further analysis a figure of $80 per cord will be used as a 1982 price for each of the communities, recognizing that this value is probably near the high end of the range.

The direct cash savings would not be large. The example below assumes that 9,300 cords of wood (per year) is used to replace 3,500,000 litres of heating oil.

Cost of 3,500,000 litres of oil	@	$.50	$1,750,000
Cost of 9,300 cords of seasoned wood	@	80.00	$ 750,000
Manpower to maintain fires & related tasks, 10,000 days	@	$50.00	$ 500,000
Cash saving before capital cost			$ 500,000

The cash saving would be modest at wood costs in the order of $80 per cord and heating oil at a cost landed of fifty cents per litre. A saving of $500,000 would justify a capital investment in retrofitting of perhaps $3,500,000.

There would be a number of implications, both positive and negative, beyond the direct cash costs and benefits of such a conversion. Major benefits would include the generation of a considerable amount of local employment and a reduction in demand in Canada for oil. Such a conversion would require the establishment of a reliable wood supply in each of the communities affected, and the organization and maintenance of a completely reliable janitorial service to ensure that buildings were heated at all times and that safety measures were carefully observed. A wood-fueled heating system might still prove somewhat less satisfactory than oil to persons providing educational, health and other services, and this in turn could create problems for the administrators of organizations providing the services.

Cutting and bucking 9,300 cords of firewood should generate about 6,200 man days of work per year. (This assumes 1.5 cords per man day, a productivity level not difficult to achieve.) The task of firing with wood rather than with automated oil-fired equipment would require the availability of janitorial personnel at frequent intervals, day and night, seven days a week, for some nine months of each year. This could require up to 10,000 man days per year (2 or 3 persons per community) at a cost of perhaps 500,000 dollars per year.

The diversion of a cash flow of some $1,250,000, as shown in the illustrative example, away from outside supply of oil and toward employment within the community, would probably be the largest single economic development project undertaken in the region in some time. There would be secondary benefits deriving from the multiplier effect of such expenditures which should reach at least 1.5 times primary benefits. Total employment benefit, measured as man-days, would thus approximate 1.5 x 16,200 = 24,300 man days employment per year; an average of more than 1600 man-days per community. In practical terms from ten to fifteen full- and part-time jobs could be expected in communities converting the heating systems of public, institutional and commercial buildings from oil to wood.

The beneficiaries of conversions would be primarily local. The direct cash savings to governments supplying services would be modest, and there might be additional administrative problems. The local employment effect, however, would be considerable.

Substitution of wood-burning heating equipment for oil-fired units could occur more realistically as part of the overall replacement programs of the various institutions and other user groups. Hypothetical situations are shown in Table 3.1, assuming replacements with similar output capabilities, neglecting cost of removal of oil-burning units (zero salvage value is probable), and allowing for no complications at installation.

Costs for any particular retrofit would depend heavily on the degree of difficulty of adapting to the existing heating system. Availability of suitable wood-burning equipment for the larger heating systems could be a problem but a wide range of units is currently available for residential

applications. In many cases no modification or reconstruction of chimney or heat-distribution system (e.g., ductwork for a forced-air system) would be required and only minor alterations (e.g., matching of hot- and cold-air plenums to the ductwork) would be necessary. A major consideration would be the delivery of materials from the supply point, affecting both timing and, to a minor extent, costs. Additive costs could include importation of tradesmen, if necessary for installation, and intangibles such as instruction of residents and operators and any decrease in convenience or comfort to occupants.

In light of the above, the cost estimates shown in Table 3.1 should be considered to be minimum requirements. Although some costs are not accounted for, the significant reduction in fuel costs nevertheless would appear to favour conversion to wood space heating. In addition, the continuing expenditure made locally for the fuel wood would be expected to be a positive benefit to the communities' economies.

It should be noted that, in the foregoing discussion, repairs and improvements to structures to effect reductions in the demand for space heat have not been considered. Efforts toward this end will result in decreased fuel costs (oil or wood) and possibly smaller sizes for replacement wood-burning heating plants. The economies of oil-to-wood space-heating conversions under conditions of significantly improved heat retention capability may be considerably smaller than those indicated above. This, however, is a further indication that proposed energy conservation measures in the remote communities must be examined in terms of their overall implications.

TABLE 3.1

TYPICAL OIL-TO-WOOD CONVERSIONS IN REMOTE COMMUNITIES

Application	Minimum Costs (1982)[1]	Approx. oil displaced (l/yr)[2]	Approx. Wood Consumption (cords/yr)[2]	Annual Fuel Costs oil[3]	wood[4]	diff.
100,000 BTU/hr output forced-air furnace[5]	$ 1,200	$ 5,500	14.6	$1,760	$1,170	$ 590
500,000 BTU/hr output forced-air furnace	12,000	27,300	72.8	8,740	5,820	2,920
260,000 BTU/hr output wood-fired boiler	6,000	14,200	37.9	4,540	3,030	1,510

1. Costs include f.o.b. Winnipeg, delivery to Island Lake area ($0.11 per kg by winter road), and installation.

2. Basis: design day = 2 percent of annual consumption.

3. Cost at Island Lake area: $0.32 per litre.

4. Assumed $80 per cord.

5. Suitable for single-detached residence. Radiating or circulating wood stoves are available for less than half the cost, but output capabilities of such units are generally lower.

3.3 FUEL-WOOD CONSERVATION

Some 1,300 houses and a small number of other buildings in the fifteen communities are heated with an estimated 22,000 cords of fuel wood, mostly harvested and prepared by the householders. This represents some 73,000 kWh equivalent of primary energy, or perhaps 40,000 kWh equivalent delivered energy per household. The houses are small, and used by relatively large numbers of people: in most communities, seven or more on the average. This compares to an average energy consumption for heating purposes, per household, in Manitoba, of about 22,000 kWh equivalent. The small, heavily used northern houses should not exceed his figure, and energy-efficient housing would function nicely on less than one half of the Provincial average.

Even a cursory examination of the quality of housing in the remote communities, and in Churchill, reveals serious inadequacies of design and construction which result in excessive heating energy use. The excess fuel consumption attributable to existing housing is equivalent to at least 11,000 cords per year of wood, and this volume is divided more or less evenly, on a per capita basis, among the communities. As new housing is constructed to meet the needs of a rapidly increasing population the magnitude of the waste will grow. A new house built to standards representative of those now in use will require some 17 cords per year of fuel wood. Reasonably efficient design would permit new homes requiring perhaps one third of that amount. Some housing recently constructed might be

retrofitted to achieve a fifty percent saving in fuel wood.

3.4 ALTERNATIVE ELECTRICAL SUPPLIES

All of the communities investigated in preparation of this profile are supplied with electricity from diesel electric generating stations located in or close to the community. Table 3.2 indicates the installed diesel electric capacity at each community. These stations are owned and operated by Manitoba Hydro and consumer rates for the service are established at a level to recover fuel, operating, and capital retirement costs. Table 3.2 indicates, in addition to the diesel electric service capacity, the approximate current level of annual peak and annual electrical energy demand for each community. The annual consumption of imported diesel fuel for these generating units is presented in Chapter 2.

Practical alternatives to the diesel electric supply are transmission interconnection with the central electrical supply network or, for those communities with a potential hydro-electric site within reasonable transmission distance, development of local hydro-electric power. Table 3.3 indicates those communities with hydro-electric potential within reach, the approximate location of the most promising site, its probable capability, and approximate transmission distance to the community. Also indicated on Table 3.3 is the peak demand for each community estimated on the assumption that the customer price and service limitations of the Manitoba Hydro integrated system apply. These estimates assume the per capita electrical consumption and load factor for the average of Manitoba

TABLE 3.2

ELECTRICAL DEMAND AND SUPPLY 1981-82

Community	Population[1]	Electrical Demand		Electrical Supply	
		Annual Energy 10^6 KWh	Annual Peak KW	Installed kW	Firm kW
Brochet	640	0.92	190	650	350
Garden Hill	1800	3.18	760	1600	1100
God's Lake Narrows	1250	1.95	408	1400	900
God's River	250	0.37	95	350	175
Granville Lake	140	0.05	18	60	40
Lac Brochet	380	0.27[2]	66[2]	525	350
Oxford House	1250	1.68	385	1100	600
Pikwitonei	240	0.37	86	350	175
Pukatawagan	1100	0.96	270	850	350
Red Sucker Lake	425	0.57	140	525	350
St. Theresa Point	1450	1.75	475	1275	775
Shamattawa	680	0.56	132	350	175
Tadoule Lake	215	0.19[2]	46[2]	350	175
Thicket Portage	200	0.40	88	300	225
Waasagomach	730	1.14	280	900	600
Churchill	1600	22.24	6150[3]	11248	8748

1 Estimate for early 1983.

2 Estimate; plants commissioned fall of 1981 (Lac Brochet) and mid 1982 (Tadoule Lake).

3 1979/80.

TABLE 3.3

POTENTIAL LOCAL HYDRO ELECTRIC SITES

Community	Probable Peak Electrical Demand kW	Local Hydro Capability		Potential Hydro Site Location	Transmission Distance to Community KM	
		Capacity[1] kW	Annual Firm Energy 10^6 kWh			
Brochet	750	4600	18	Cochrane River	15	
Garden Hill	1970	6500	20	Island Lake River	32	
		Not estimated		Hink River	25	
		4500	14	Kenuchewan	45	
God's Lake Narrows	1320	9600	30	God's River	70	Capability shown is that for Kenuchewan
		Not estimated		God's Lake Narrows	0	
God's River	270	9600	30	God's River	10	
Granville Lake	160	Large	Large	Churchill River at Granville Falls	15	
Lac Brochet	440	4600	18	Cochrane River	16	
Oxford House	1280	1400	4	Hayes River	8	
Pikwitonei	280	150	0.5	Pikwitonei River	2	
Pukatawagan	1280	Large	Large	Churchill River	16	
Red Sucker Lake	420	950	3	Red Sucker River	6	
St. Theresa Point	1530	1600	5	Mainland River	32	Same site as Wasagamach
Shamattawa	790	0	0			
Tadoule Lake	250	800	2	North Seal River	15	
Thicket Portage	233	0	0			
Wasagamach	720	1600	5	Mainland River	20	Same site as St. Theresa Point
Churchill		0	0			

Note - Probable peak electrical demand is based on a per capita consumption of 4600 kWh per year and a load factor of 0.45.

- Capability is based on a load factor of 0.45 and 25 percent reserve capacity. Estimates of firm capability are based on very preliminary data and subject to revision.

residential and farm service. The values shown for hydro-electric capability assume that this load must be met.

Table 3.3 indicates no opportunity for local hydro-electric development at the communities of Shamattawa, Thicket Portage and Churchill. While this is not strictly true, it is concluded that potential for local supply is so unfavourable that, for Churchill and Thicket Portage it would not be economically competitive with interconnection to the central transmission service and, for Shamattawa, not competitive with the existing diesel electric generation. However, this conclusion is based on a very preliminary assessment and does not rule out disclosure of a favourable option through more detailed investigation. Similarly, inclusion of a local hydro-electric supply in Table 3.3 does not infer its economic favourability.

Should local hydro-electric supply be a favourable option for some of the communities in the vicinity of God's Lake and Island Lake, there is also potential for interconnecting some of the communities and supplying this network from one or more of the several hydro-electric sites in the vicinity.

Table 3.4 is provided as an indication of relative cost of electric supply options for each community by showing approximate annual generation costs using the existing diesel electric generation, by interconnection to the central system transmission network, and by development of local hydro-electric supply. The values should be used with caution since the level of accuracy varies between alternatives. For this reason the bases of the figures are provided as follows:

Annual diesel electric costs consist of fuel cost, operating capital retirement, administration and miscellaneous costs provided by Manitoba Hydro for the year 1981-82.

Annual central service supply costs are computed using rough estimates of transmission interconnection costs provided by Manitoba Hydro. An amortization period of 45 years at 12 percent interest rate was used to estimate annual capital costs and 2 percent of capital cost was added to allow for annual maintenance and operation. Central supply energy is assumed to cost $.03/kWh and demand is assumed to rise to the average central supply per capita consumption of residential and farm customers.

The column headed "Cost of Local Hydro Electric ..." is included to provide a comparative value only. It shows annual cost based on a capital cost of $4000 per kW of installed capacity, an amortization period of 45 years and an interest rate of 12 percent with 2 percent of capital cost added for annual maintenance and operation. Actual cost of local hydro-electric development is sensitive to site conditions and may vary widely. The values provided in Table 3.4 probably represent the higher part of this range.

Not only does the quality of the data for Table 3.4 vary but the benefits of the three alternatives also vary. A large portion of the diesel electric supply cost is for fuel and therefore residential service has been limited as a conservation measure. However, for central system supply and local hydro supply it is assumed that this restriction will not apply and consumption will approach the provincial per capita average for residential and farm customers. The validity of this assumption will also depend on the actual cost to the customers of the alternative supply.

Other local sources of electrical energy are thermal electric generation fueled by wood, wind-power supplementation to reduce diesel fuel consumption, and wood gasification as an alternate fuel supply for diesel electric generation. Costs of these alternatives have not been investigated for this study, but their viability seems doubtful because of high cost and increased complexity of operation.

TABLE 3.4

ANNUAL COST OF ELECTRICAL ENERGY SUPPLY

Community	Diesel[1] Electric $/year	Central[2] System Supply $/year	Cost of Local Hydro-Electric[6] @ $4000 per installed kW $/year
Brochet	222200	1288000[3]	527800
Garden Hill	638800	1587000[4]	1386300
God's Lake Narrows	342300	988000[4]	928900
God's River	117100	191000[4]	190000
Granville Lake	60000	79000	112600
Lac Brochet	255150	403000[3]	309600
Oxford House	327600	866000[4]	900700
Pikwitonei	138100	209000[5]	197000
Pukatawagan	233600	517000	900700
Red Sucker Lake	151500	292000[4]	295500
St. Theresa Point	351500	926000[4]	1076600
Shamattawa	217200	882000	555900
Tadoule Lake		281000[3]	175900
Thicket Portage	108900	190000[5]	164000
Waasagomach	229300	571000[4]	506700
Churchill	3235700	3763000	

Notes:

1. Computed for year 1981/82 from data provided by Manitoba Hydro, Eastern Region.

2. Computed from Manitoba Hydro "ball park" estimates of transmission and transformation capital cost. Annual costs are estimated assuming 45 years amortization at a 12 percent interest rate with annual operation and maintenance at 2 percent of capital cost and system energy provided at $0.03 per kWh.

3. Transmission costs are prorated according to annual energy consumption to obtain a proportion of the cost of a system interconnecting Brochet, Lac Brochet and Tadoule Lake.

TABLE 3.4 (continued)

4. Transmission costs are prorated according to annual energy consumption to obtain a proportion of the cost of a system interconnecting Garden Hill, God's Lake Narrows, God's River, Oxford House, Red Sucker Lake, St. Theresa Point, and Waasagomach.

5. Transmission costs are prorated according to annual energy consumption to obtain a proportion of the cost of a system interconnecting Pikwitonei and Thicket Portage.

6. Annual cost of local generation assuming capital cost of $4000 per installed kW, 25 percent spare capacity on probable peak demand shown on Table 3.3, 45 years amortization at a 12 percent interest rate and annual operation and maintenance at 2 percent of capital cost.

Local electrical generation of any kind provides a benefit to the communities in the form of increased opportunity for development of local labour and services. The provision of central service supply would eliminate that labour and services now engaged for the diesel electric plants, although a requirement might be created for transmission line construction and maintenance. Local hydro-electric generation would require local labour and services for both the construction and operating phases. Requirements for local labour and services have not been evaluated, but the need and opportunities would vary between electrical supply alternatives.

3.5 OIL CONSERVATION AT CHURCHILL

Wood is unavailable at Churchill, which is located in a tundra environment. Wood could be made available from points further south, on the rail line, and transported north to Churchill for use as heating fuel. It would appear that wood produced and handled in this way would be very little cheaper than the next cheapest fuel, liquefied propane gas, and would be somewhat less convenient.

At present most residential and commercial heating loads in Churchill are met with propane, but there are significant large institutional users (mainly under Federal Government authority) who continue to employ heating oil. The question of connecting Churchill to the Manitoba Hydro main grid is currently under study and negotiation. If such interconnection were made, and electrical energy were made available in Churchill at central system rates, electrical energy for heating would be the cheapest energy

source. If present diesel electric generation is maintained, propane is the cheapest alternative. Moreover, use of electrical energy for heating purposes would increase cash flows available to meet the cost of interconnection with the main power grid.

The issues and opportunities to conserve oil at Churchill are clear and study and negotiation, currently underway, will presumably resolve them.

CHAPTER 4

4.0 COMMUNITY PROFILE - BROCHET

4.1 PHYSICAL SETTING

Brochet comprises an Indian and Metis community situated on the northern shore of Reindeer Lake approximately 10 km west of the mouth of the Cochrane River. Relief in the area is low but irregular. Surface materials are granular, generally consisting of sand and boulders with scattered rock outcrops. To the north of the community the outcrops are more extensive. Permafrost is common. Forest cover in the area is continuous but small, mainly jackpine and spruce.

4.2 POPULATION AND INCOME

The current population of Brochet is estimated at 640. This represents a decline from a decade ago. The decline results from subdivision of the community and the migration of many residents to the new community of Lac Brochet.

Family size in Brochet is large and the population is very young. Families with eight members or more make up almost 50 percent of the population and families with more than five members make up more than 70 percent. Children under the age of fifteen make up almost 50 percent of the population and 90 percent is under the age of fifty. The rate of population increase is very rapid.

Commercial fishing on Reindeer Lake, some trapping and local work projects plus provision of standard services provide employment. Per capita income was estimated in 1974 at more than $800, a relatively high figure for remote communities in Manitoba at that time. Subdivision of the community may have affected both per capita income and the age distribution of the population of Brochet and Lac Brochet somewhat during recent (1980-82) years.

4.3 ENERGY PROFILE

A description of current facilities and energy use in Brochet is shown in Tables 4.1, 4.2, 4.3.

TABLE 4.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - BROCHET

Consumptive Group	Facilities
Education	16 classroom school with gym (2241 m²), 13 teacherages: oil heat, some propane appliances.
Health	Single-storey frame nursing station (630 m²), 1 residence (160 m² trailer), and garage (71 m²): full-time use, oil heat, electric lights, fridge, stove, freezer, washers, dryer.
Protection	Patrol cabin with office and cells (78 m² trailer): not in full-time use, oil heat supplemented with kerosene if required, electric stove, hot water.
Communications	Telephone exchange (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, electric heat.
Transport Services	Airport terminal (120 m²), equipment shelter and shop (186 m²): oil heat.
Community Services	Administrative office, community hall (200 person capacity): oil heat; water supply line, standpipes, and pumphouse: propane and electric heat; outdoor lighting.
Commercial - major - minor	Store with service residence: oil heat. Pool hall, store, agency, church.
Residential	Approximately 69 houses with electrical service (early 1982).

TABLE 4.2

ENERGY PROFILE - ANNUAL CONSUMPTION - BROCHET

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	345	188	40	-
Health	87	31	[illegible]	-
Protection	7	6	-	-
Communications	35	-	-	-
Transport Services	18	9	-	-
Other Government	-	-	-	-
Community Services	54	25	7	-
Commercial - major	91	18	-	-
- minor	13	13	-	33
Residential	306	-	-	1152
Total	956	290	47	1185

TABLE 4.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - BROCHET

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	5236	7276	109	-	12621
Health	1320	1200	-	-	2520
Protection	106	232	-	-	338
Communications	531	-	-	-	531
Transport Services	273	348	-	-	621
Other Government	-	-	-	-	-
Community Services	820	968	19	-	1807
Commercial - major	1381	697	-	-	2078
- minor	197	503	-	521	1221
Residential	4644	-	-	18202	22846
Total	14509	11223	128	18723	44583

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 5

5.0 COMMUNITY PROFILE - GARDEN HILL

5.1 PHYSICAL SETTING

The community of Garden Hill is located partly on the north shore of Island Lake and partly on adjacent Stevenson Island. Relief is rough with a maximum variation in elevation of about 20 metres locally. The land surface is predominantly rock outcrop with scattered till deposits at higher elevations and lacustrine clays and silts near lake level. Granular deposits are scarce. Forest cover is continuous in the vicinity except in areas of rock outcrop. Organized fuel wood supplies may present some access problems.

5.2 POPULATION AND INCOME

Garden Hill is the largest of the fifteen communities in the Island Lake area with a population currently estimated at 1,800, an increase from 1,688 reported in 1978. About 46 percent of the population was under fourteen years in 1978.

As in the other remote communities, commercial fishing, trapping and works projects supplement service industry employment. Unemployment is high and per capita income low. Income was estimated at about $525 per capita in 1974.

5.3 ENERGY PROFILE

A description of current facilities and energy use in Garden Hill is shown in Tables 5.1, 5.2 and 5.3.

TABLE 5.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - GARDEN HILL

Consumptive Group	Facilities
Education	2 storey school with gym (2962 m², including second floor): oil-fired boiler; 1 classroom building (609 m²), nursery (167 m²), 6 teacherage buildings, including several multiple units and 2 trailers (988 m²): oil furnaces, propane water heater, dryer and stove in trailers, dryer and stove in one duplex; under construction in 1982 was 2 storey, 12-unit teacherage to replace building destroyed by fire.
Health	Single-storey frame nursing station (1179 m²), 3 residences (88 m², 91 m², 91 m² trailers), and garage (67 m²): full-time use, oil heat, electric fridges, stoves, washers, dryers, freezers, lights, some propane used; unheated storage building (22 m²).
Protection	Patrol cabin with office and cells (78 m² trailer), sleeping quarters (78 m² trailer): not in full-time use, oil heat supplemented with kerosene if required, electric stove, hot water.
Communications	Telephone exchange (53 m²), 2 other buildings: unmanned, electrical equipment and air conditioning, waste heat from equipment, oil heat; weather station consisting of office, 2 residences, and garage: oil heat, electric stoves.
Transport Services	Airport terminal (282 m²), equipment shelter and shop (384 m²): oil heat.
Other Government	Conservation office and bunkhouse: oil heat; residence: oil heat supplemented with electric heat; warehouse.

Community Services	Administrative office (297 m²); 2 community halls; water supply and treatment system, standpipes and hydrants: oil-fired boiler; outdoor lighting.
Commercial - major	Store with 3 service residences: oil heat.
- minor	Store, lodge, agencies, local enterprises, churches.
Residential	Approximately 265 houses with electrical service (early 1982).

TABLE 5.2

ENERGY PROFILE - ANNUAL CONSUMPTION - GARDEN HILL

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	871	380	53	-
Health	206	45	2	-
Protection	7	6	-	-
Communications	96	35	-	-
Transport Services	90	41	-	-
Other Government	22	18	-	-
Community Services	172	45	-	38
Commercial - major	193	22	-	-
- minor	83	34	-	91
Residential	1438	-	-	4028
Total	3178	626	55	4157

2 trail

TABLE 5.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - GARDEN HILL

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	12257	14706	144	-	27107
Health	2899	1742	5	-	4646
Protection	99	232	-	-	331
Communications	1351	1355	-	-	2706
Transport Services	1267	1587	-	-	2854
Other Government	310	697	-	-	1007
Community Services	2421	1742	-	600	4763
Commercial - major	2716	851	-	-	3567
- minor	1168	1316	-	1438	3922
Residential	20237	-	-	63642	83879
Total	44723	24226	150	65681	134780

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 6

6.0 COMMUNITY PROFILE - GOD'S LAKE NARROWS

6.1 PHYSICAL SETTING

God's Lake consists of two interconnected basins. God's Lake Narrows is located at the interconnecting constriction which consists of two channels. The community occupies both the north and south shore of the constriction and the island separating the two channels. Relief is rugged with a maximum variation of about 50 metres locally. The land surface is predominantly rock outcrop with areas of overburden increasing in extent to the west of the community. The overburden is predominantly a coarse granular till with occasional pockets of permafrost-affected lacustrine clay and silt at low elevations. Forest cover is continuous except on some outcrops and fuel-wood supplies can probably be found within easy reach of the winter road both north and south of the community.

6.2 POPULATION AND INCOME

The population of God's Lake Narrows is estimated at 1,250, an increase from the 1129 reported in 1978. More than 44 percent of the population, in 1978, was under 14 years of age.

Commercial fishing and fish processing, trapping, and tourism provide employment additional to work projects and the provision of standard local services. Unemployment is high, however. No estimate of per capita income is available for God's Lake Narrows.

6.3 ENERGY PROFILE

A description of current facilities and energy use in God's Lake Narrows are shown in Tables 6.1, 6.2 and 6.3.

TABLE 6.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - GOD'S LAKE NARROWS

Consumptive Group	Facilities
Education	School with gym (3314 m²), 1 detached classroom (91 m²), 4 teacherage buildings, including several multiple units (1266 m²): oil heat, propane dryer and stove in duplex; under construction in 1982 were 3 classrooms and a triplex teacherage.
Health	Single-storey frame nursing station and integral residence (673 m²) as replacement (1982) for old nursing station (427 m²), single-storey frame garage (18 m²), 1 residence (58 m² trailer): full-time use, oil heat, electric lights, fridges, stoves, freezers, washers, dryers; 2 storage sheds (6 m², 6 m²) and boathouse (27 m²): unheated.
Protection	Patrol cabin with office and cells (78 m² trailer), sleeping quarters (78 m² trailer): not in full-time use, oil heat supplemented with kerosene if required, electric stove, hot water.
Communications	Telephone exchange (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, electric heat; T.V. and radio transmitters in separate buildings: waste and electric heat.
Transport Services	Airport terminal (175 m²), equipment shelter and shop (228 m²): oil heat.
Other Government	Conservation office-residence, residence trailer: oil heat; garage.
Community Services	Administrative office; community hall (75 person capacity); water supply line, treatment system, and standpipes; outdoor lighting.

Commercial - major	Store with 2 service residences: oil heat; warehouse.
- minor	Store (157 m²), lodge, agencies, local enterprises, churches.
Residential	Approximately 150 houses with electrical service (early 1982).

TABLE 6.2

ENERGY PROFILE - ANNUAL CONSUMPTION - GOD'S LAKE NARROWS

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	492	265	45	-
Health	50	32	-	-
Protection	16	6	-	-
Communications	72	-	-	-
Transport Services	52	24	-	-
Other Government	6	13	-	-
Community Services	93	19	-	17
Commercial - major	167	46	-	-
- minor	50	12	-	50
Residential	761	-	-	2475
Total	1759	417	45	2542

TABLE 6.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - GOD'S LAKE NARROWS

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	7323	10256	122	-	17701
Health	744	1238	-	-	1982
Protection	238	232	-	-	470
Communications	1072	-	-	-	1072
Transport Services	774	929	-	-	1703
Other Government	89	503	-	-	592
Community Services	1384	735	-	269	2388
Commercial - major	2486	1780	-	-	4266
- minor	744	464	-	790	1998
Residential	11327	-	-	39105	50432
Total	26182	16138	122	40164	82606

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 7

7.0 COMMUNITY PROFILE - GOD'S RIVER

7.1 PHYSICAL SETTING

The community of God's River is situated on the northern shore of God's Lake adjacent to the lake's outlet into God's River. Relief is gentle and bedrock outcrops are rare. The shoreline in the vicinity is till and lacustrine clays and silts, mostly permafrost-affected. Forest cover is continuous but thin with small trees, mostly spruce.

7.2 POPULATION AND INCOME

The current population of God's River is estimated at 250, an increase from the 231 reported in 1978. In that year some 47 percent of the population was under 14.

Limited employment is generated by commercial fishing and the service sector. Nevertheless, unemployment is high. Per capita income has not been estimated, but is considered to be low.

7.3 ENERGY PROFILE

A description of current facilities and energy use in God's River is shown in Tables 7.1, 7.2 and 7.3.

TABLE 7.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - GOD'S RIVER

Consumptive Group	Facilities
Education	School (418 m^2), 1 duplex (223 m^2), 1 trailer (76 m^2): oil heat, propane water heater, dryer and stove in trailer.
Health	Health station (58 m^2 trailer): used by visiting health personnel but heated with oil full time, electric lights, fridge, propane stove.
Communications	Telephone exchange (53 m^2): unmanned, electrical equipment and air conditioning, waste heat from equipment, electric heat.
Transport Services	Private airstrip, electricity self-generated.
Community Services	Administrative office and community hall; water supply and treatment system with standpipes; outdoor lighting.
Commercial - minor	Store and post office (96 m^2), garage (119 m^2), pool hall, church.
Residential	39 houses with electrical service (early 1982).

TABLE 7.2

ENERGY PROFILE - ANNUAL CONSUMPTION - GOD'S RIVER

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	96	50	22	-
Health	34	5	2	-
Protection	-	-	-	-
Communications	35	-	-	-
Transport Services	N/A	N/A	N/A	N/A
Other Government	-	-	-	-
Community Services	28	6	-	17
Commercial - major	-	-	-	-
- minor	10	6	-	17
Residential	180	-	-	651
Total	383	67	24	685

TABLE 7.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - GOD'S RIVER

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	1812	1935	60	-	3807
Health	642	194	5	-	841
Protection	-	-	-	-	-
Communications	661	-	-	-	661
Transport Services	N/A	N/A	N/A	N/A	N/A
Other Government	-	-	-	-	-
Community Services	529	232	-	269	1030
Commercial - major	-	-	-	-	-
- minor	189	232	-	269	690
Residential	3398	-	-	10286	13684
Total	7230	2593	65	10823	20711

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 8

8.0 COMMUNITY PROFILE - GRANVILLE LAKE

8.1 PHYSICAL SETTING

The community is located on a peninsula on the southern shore of Granville Lake some 15 km west of the Churchill River's entrance to the lake at Granville Falls. Relief is moderate with local differences in elevation of approximately 30 metres. The relief is bedrock-controlled but outcrops are scattered and overburden is till with lacustrine silt and clay at lower elevations. Forest cover is moderately heavy mixed forest growing to a good size in most locations.

8.2 POPULATION AND INCOME

The current population of Granville Lake is estimated at 140, an increase from 119 reported in 1978. At that time 57 percent of the population was under 14 and one person was over 65.

Commercial fishing, trapping and work programs provide income. These can be augmented by employment in mining communities in the vicinity, and in other industrial or service employment. The community is relatively new and growing rapidly. No estimate of per capita income is available.

8.3 ENERGY PROFILE

A description of current facilities and energy use in Granville Lake is shown in Tables 8.1, 8.2 and 8.3.

TABLE 8.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - GRANVILLE LAKE

Consumptive Group	Facilities
Education	Single-storey school (120 m²) and teacherage (89 m²): oil heat, some propane appliances (school lost in fire, replacement planned - 1982).
Other Government	Government agency: oil heat.
Community Services	Administrative office; community hall (100 person capacity); water supply line, stand pipe, and pumphouse: propane heat; outdoor lighting.
Commercial - minor	Store.
Residential	9 houses with electrical service (early 1982).

TABLE 8.2

ENERGY PROFILE - ANNUAL CONSUMPTION - GRANVILLE LAKE

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	11	17	4	-
Health	-	-	-	-
Protection	-	-	-	-
Communications	-	-	-	-
Transport Services	-	-	-	-
Other Government	6	6	-	-
Community Services	9	-	7	16
Commercial - major	-	-	-	-
- minor	6	-	-	32
Residential	22	-	-	143
Total	54	23	11	191

TABLE 8.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - GRANVILLE LAKE

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	355	658	11	-	1024
Health	-	-	-	-	-
Protection	-	-	-	-	-
Communications	-	-	-	-	-
Transport Services	-	-	-	-	-
Other Government	194	232	-	-	426
Community Services	290	-	19	253	562
Commercial - major	-	-	-	-	-
- minor	194	-	-	506	700
Residential	710	-	-	2259	2969
Total	1742	890	30	3018	5680

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 9

9.0 COMMUNITY PROFILE - LAC BROCHET

9.1 PHYSICAL SETTING

Lac Brochet community was established about 1980 by people previously resident in Brochet. The community is located on the north shore of Lac Brochet which is drained by the Cochrane River. Relief is generally gentle except for portions of the lake shore, and local changes in elevation are 10 metres or less. Rock outcrops are rare and surface irregularities are mainly drumlinoid features trending 020-200 degrees. Surface material between these features is mainly sand. Permafrost is extensive. Forest cover is thin and scattered consisting mainly of jackpine and spruce. Larger trees grow in a fringe of better-drained soils close to the lake shore.

9.2 POPULATION AND INCOME

The population of Lac Brochet has migrated from Brochet during the last five years. It is currently (1982) estimated to total about 380. Like the population of Brochet, the population of this community is young, some fifty percent being fifteen years of age or less.

Cash income derives from trapping and works projects.

9.3 ENERGY PROFILE

A description of current facilities and energy use in Lac Brochet is shown in Tables 9.1, 9.2 and 9.3.

TABLE 9.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - LAC BROCHET

Consumptive Group	Facilities
Education	1 double classroom (178 m²), 6 detached single classrooms (569 m²), 3 teacherages (284 m²): oil heat, some propane appliances; 12 units under construction in 1982, classrooms and teacherages.
Health	Single-storey frame health station and residence (201 m²), and garage (60 m²): used by visiting health personnel but heated with oil full time, electric fridge, lights, propane stove.
Protection	Integral patrol cabin and sleeping quarters (78 m² trailer): not in full-time use, oil heat supplemented with kerosene if required, propane stove.
Communications	Telephone exchange (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, electric heat.
Transport Services	Airport terminal (41 m²), equipment shelter and shop (99 m²): oil heat.
Community Services	Administrative office (107 m²); outdoor lighting.
Commercial - minor	Motel (86 m²), store with oil heat.
Residential	21 houses with electrical service (early 1982).

TABLE 9.2

ENERGY PROFILE - ANNUAL CONSUMPTION - LAC BROCHET

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (1 in 000's)	Propane (1 in 00's)	Wood (cords)
Education	112	46	54	-
Health	29	12	3	-
Protection	6	7	1	-
Communications	35	-	-	-
Transport Services	4	16	-	-
Other Government	-	-	-	-
Community Services	19	-	-	17
Commercial - major	-	-	-	-
- minor	15	13	-	17
Residential	50	-	-	365
Total	270	94	58	399

TABLE 9.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - LAC BROCHET

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	2167	1780	147	-	4094
Health	561	464	8	-	1033
Protection	116	271	3	-	390
Communications	677	-	-	-	677
Transport Services	77	619	-	-	696
Other Government	-	-	-	-	-
Community Services	368	-	-	269	637
Commercial - major	-	-	-	-	-
- minor	290	503	-	269	1062
Residential	968	-	-	5767	6735
Total	5225	3638	158	6304	15325

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 10

10.0 COMMUNITY PROFILE - OXFORD HOUSE

10.1 PHYSICAL CHARACTERISTICS

The community of Oxford House is located at the eastern end of Oxford Lake at its outlet into Black Lake and the Hayes River. The community extends for some 5 km along the shore of Oxford Lake and the Hayes River channel between Oxford and Black Lake. Relief is mostly gentle with local changes in elevation generally less than 10 metres. Rock outcrops are rare and the principal surface features are drumlinoid ridges. Surface material is mainly till with extensive permafrost in the low areas between the ridges. A large kame composed of fine granular material lies on the north of the Hayes River opposite the community. A large deposit of granular material also lies to the southeast of the community and is traversed by the winter road. Forest cover is continuous mixed forest except on the granular deposits where jackpine is predominant.

10.2 POPULATION AND INCOME

The 1982 population of Oxford House is estimated at 1250. The population in 1978 was 1098. About 44 percent of the population was under 14 years of age. Manitoba Hydro statistics indicate that about 175 houses are currently serviced with electricity.

Commercial fishing, trapping and the service sector are the major employers. Unemployment is very high. Per capita income in Oxford House

in 1974 was estimated at about $600, approximately the average for the remote communities.

10.3 ENERGY PROFILE

A description of current facilities and energy use in Oxford House is shown in Tables 10.1, 10.2 and 10.3.

TABLE 10.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - OXFORD HOUSE

Consumptive Group	Facilities
Education	School with gym (2886 m²), detached classroom building (224 m²), 8 teacherage buildings including 1 sixplex, 1 triplex, 1 two-storey duplex, 2 single houses and 3 trailers (1014 m²): oil heat except for school in which oil-fired hot water system has been converted to use waste heat recovered from nearby electrical generation plant, no propane appliances; 1 classroom and 1 two-bedroom teacherage under construction in 1982.
Health	Frame-with-basement nursing station (623 m²), residences (58 m², 88 m² trailers), and garage (78 m²): full-time use, oil heat, electric lights, fridges, stoves, washer, dryer, freezer; unheated boat house.
Protection	Patrol cabin with office and cells (78 m² trailer), sleeping quarters (78 m² trailer): not in full-time use, oil heat supplemented with kerosene if required, electric stove, hot water.
Communications	Telephone exchange and T.V. transmitter (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, electric heat.
Transport Services	Airport terminal (175 m²), equipment shelter and shop (185 m²): oil heat.
Other Government	Conservation office, bunkhouse, pumphouse, and garage.
Community Services	Administrative office (268 m²); community hall (143 m²); outdoor lighting.

Commercial - major	Store with 2 service residences and warehouse: oil heat.
- minor	Store, 2 agencies, local enterprise, churches.
Residential	177 houses with electrical service (early 1982).

TABLE 10.2

ENERGY PROFILE - ANNUAL CONSUMPTION - OXFORD HOUSE

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	477	289[1]	-	-
Health	106	30	-	-
Protection	2	6	-	-
Communications	50	-	-	-
Transport Services	17	16	-	-
Other Government	3	6	-	-
Community Services	49	18	-	16
Commercial - major	184	29	-	-
- minor	30	12	-	49
Residential	760	-	-	2885
Total	1678	406	-	2950

1 Includes approximately 200,000 l which has been replaced (1982) through utilization of waste heat from electric generator.

TABLE 10.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - OXFORD HOUSE

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	6546	11184[2]	-	-	17730
Health	1455	1161	-	-	2616
Protection	27	232	-	-	259
Communications	686	-	-	-	686
Transport Services	233	619	-	-	852
Other Government	41	232	-	-	273
Community Services	672	697	-	253	1622
Commercial - major	2525	1122	-	-	3647
- minor	412	464	-	774	1650
Residential	10430	-	-	45583	56013
Total	23028	15712	-	46610	85350

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

2 Includes approximately 7740 GJ which has been replaced (1982) through utilization of waste heat from electric generator.

CHAPTER 11

11.0 COMMUNITY PROFILE - PIKWITONEI

11.1 PHYSICAL SETTING

Pikwitonei is situated on the CNR Churchill railway line at its crossing of the Pikwitonei River, a tributary of the Grass River. Relief in the area is moderate with local elevation changes of up to 10 metres. Bedrock outcrops are rare except on the river banks. Overburden is generally shallow lacustrine materials overlying till and is sporadically affected by permafrost. Forest cover is continuous and consists mainly of fairly heavy mixed forest.

11.2 POPULATION AND INCOME

The population of Pikwitonei was reported to be 203 in 1978 and more recent data was unavailable. The population declined in the seven years prior to 1978 due to migration. It may now be growing again. In 1978 some 40 percent was under 14 years of age.

This community is located on the CNR line, and employment from trapping is augmented by railroad employment and service industries. Per capita income has been estimated at almost $900 in 1974, some 50 percent higher than most remote communities.

11.3 ENERGY PROFILE

A description of current facilities and energy use in Pikwitonei is shown in Tables 11.1, 11.2 and 11.3.

TABLE 11.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - PIKWITONEI

Consumptive Group	Facilities
Education	4 classroom school with gym (711 m²), 4 single-family teacherages: oil heat, some propane appliances.
Health	Single-storey nursing station (47 m²): in use 5 days per week, oil heat.
Protection	Integral patrol cabin and sleeping quarters (78 m² trailer): not in full-time use, oil heat supplemented with kerosene if required, electric stove and hot water.
Communications	Telephone exchange (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, oil heat.
Transport Services	Railway station and residence: electric heat. Airport terminal (24 m²), equipment shelter and shop (154 m²): oil heat.
Other Government	Conservation bunkhouse; government office: oil heat.
Community Services	Administrative office; community hall in poor condition; water supply and treatment system, standpipes: propane and electric heat; outdoor lighting.
Commercial - minor	2 stores, churches.
Residential	38 houses with electrical service (early 1982).

TABLE 11.2

ENERGY PROFILE - ANNUAL CONSUMPTION - PIKWITONEI

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	65	72	12	-
Health	2	6	-	-
Protection	2	6	-	-
Communications	8	4	-	-
Transport Services	38	5	-	-
Other Government	19	12	-	-
Community Services	31	6	7	-
Commercial - major	-	-	-	-
- minor	18	13	-	17
Residential	187	-	-	535
Total	370	124	19	652

TABLE 11.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - PIKWITONEI

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	1175	2786	33	-	3994
Health	36	232	-	-	268
Protection	36	232	-	-	268
Communications	145	155	-	-	300
Transport Services	687	194	-	-	881
Other Government	344	464	-	-	808
Community Services	561	232	19	-	812
Commercial - major	-	-	-	-	-
- minor	326	503	-	269	1098
Residential	3382	-	-	10033	13415
Total	6691	4799	52	10302	21884

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 12

12.0 COMMUNITY PROFILE - PUKATAWAGAN

12.1 PHYSICAL SETTING

Pukatawagan is situated on the north shore of the Churchill River upstream of the crossing of the CNR rail line to Lynn Lake. At this point an expansion in the river forms Pukatawagan Lake. The community is connected to the railway by an 8 km road link. Relief is irregular with local variation in elevation of up to about 50 metres. Rock outcrops are numerous and overburden is mainly bouldery till with occasional deposits of lacustrine silt and clay in the vicinity of the river. Granular deposits are scarce. Forest cover is moderately heavy mixed forest.

12.2 POPULATION AND INCOME

The current population of Pukatawagan is estimated to be 1100, an increase from approximately 1000 in 1978. The age distribution of the Pukatawagan population appears to be typical of the remote communities with very large cohorts of young people and children.

Income in the Pukatawagan region is low. Some income is earned from fishing and trapping, and this is augmented by service industries and community work projects. Unemployment remains high, however, and per capita income in this community was estimated at only $500 in 1974.

12.3 ENERGY PROFILE

A description of current facilities and energy use in Pukatawagan is shown in Tables 12.1, 12.2 and 12.3.

TABLE 12.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - PUKATAWAGAN

Consumptive Group	Facilities
Education	School with gym (2906 m²), 3 teacherage buildings (593 m²), 5 trailers: oil-fired boiler in school, oil furnaces in teacherages, some propane appliances; under construction in 1982 were 5 electrically heated duplexes (740 m²).
Health	Single-storey frame nursing station (475 m²), 1 residence (58 m² trailer), and storage building (27 m²): full-time use, oil heat, electric lights, fridge, stove, washer, dryer, freezer.
Protection	Patrol cabin with office and cells (78 m² trailer), sleeping quarters (78 m² trailer): not in full-time use, oil heat supplemented with kerosene if required, propane stove.
Communications	Telephone exchange and T.V. transmitter (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, oil heat; radio transmitter in separate building.
Transport Services	Airport terminal (120 m²), equipment shelter and shop (169 m²): oil heat.
Other Government	Conservation office.
Community Services	Administrative office (78 m²); community hall (241 m²); water supply system; outdoor lighting.
Commercial - major - minor	Store with 2 service residences: oil heat. Agency and church complex.
Residential	61 houses with electrical service (early 1982); approximately 24 houses not connected.

TABLE 12.2

ENERGY PROFILE - ANNUAL CONSUMPTION - PUKATAWAGAN

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	333	136	58	-
Health	82	11	-	-
Protection	14	6	2	-
Communications	20	4	-	-
Transport Services	21	8	-	-
Other Government	2	6	-	-
Community Services	56	18	-	16
Commercial - major	121	13	-	-
- minor	7	-	-	16
Residential	303	-	-	1318
Total	959	202	60	1350

TABLE 12.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - PUKATAWAGAN

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	6575	5263	158	-	11996
Health	1619	426	-	-	2045
Protection	276	232	5	-	513
Communications	395	155	-	-	550
Transport Services	415	310	-	-	725
Other Government	39	232	-	-	271
Community Services	1106	697	-	253	2056
Commercial - major	2389	503	-	-	2892
- minor	138	-	-	253	391
Residential	5983	-	-	20824	26807
Total	18935	7817	163	21330	48245

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 13

13.0 COMMUNITY PROFILE - RED SUCKER LAKE

13.1 PHYSICAL SETTING

The Red Sucker Lake community occupies a peninsula on the northern shore of Red Sucker Lake and to the east of the lake's outlet. Relief is moderate to gentle with maximum local changes in elevation of about 10 metres. Bedrock outcrops are rare, limited mainly to parts of the lakeshore. Overburden is till with lacustrine silt and clay at lower elevation and is intermittently affected by permafrost. A deposit of granular outwash material lies to the northwest of the community. Forest cover is moderate growth, mixed and mainly spruce except on granular materials where jackpine is predominant.

13.2 POPULATION AND INCOME

The current population of Red Sucker Lake is estimated at 425, an increase from the 357 reported in 1978. At that time 47 percent of the population was fourteen years of age or younger, and only 2 percent over 65.

Red Sucker Lake is one of the least prosperous of the remote communities. A modest amount of income is generated from commercial fishing and trapping and from community works projects. The 1974 per capita income was reported to be only about $450.

13.3 ENERGY PROFILE

A description of current facilities and energy use in Red Sucker Lake is shown in Tables 13.1, 13.2 and 13.3.

TABLE 13.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - RED SUCKER LAKE

Consumptive Group	Facilities
Education	School (564 m²), 4 teacherage buildings (648 m²): oil heat, propane stove and dryer in two teacherages; one duplex under construction in 1982.
Health	Single-storey frame nursing station (94 m²), 1 residence (58 m² trailer): full-time use, oil heat, electric lights, fridge, washer, dryer, freezer, propane stove; unheated storage shed.
Communications	Telephone exchange (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, oil heat.
Transport Services	Airport terminal (120 m²), equipment shelter and shop (223 m²): oil heat.
Community Services	Administrative office (87 m²), community hall (393 m²): oil heat; water supply line and pumphouse (18 m²); sewage treatment plant (15 m²); outdoor lighting.
Commercial - major	Store with 2 service residences and warehouse: oil heat.
- minor	Store (129 m²), restaurant, agency, churches.
Residential	53 houses with electrical service (early 1982).

TABLE 13.2

ENERGY PROFILE - ANNUAL CONSUMPTION - RED SUCKER LAKE

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	129	50	26	-
Health	33	6	2	-
Protection	-	-	-	-
Communications	16	4	-	-
Transport Services	29	23	-	-
Other Government	-	-	-	-
Community Services	30	25	-	-
Commercial - major	30	21	-	-
- minor	10	12	-	17
Residential	275	-	-	875
Total	552	141	28	892

TABLE 13.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - RED SUCKER LAKE

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	1920	1935	71	-	3926
Health	491	232	5	-	728
Protection	-	-	-	-	-
Communications	238	155	-	-	393
Transport Services	432	890	-	-	1322
Other Government	-	-	-	-	-
Community Services	447	968	-	-	1415
Commercial - major	447	813	-	-	1260
- minor	149	464	-	269	882
Residential	4093	-	-	13825	17918
Total	8216	5457	76	14094	27843

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 14

14.0 COMMUNITY PROFILE - ST. THERESA POINT

14.1 PHYSICAL SETTING

The community of St. Theresa Point occupies the tip of a peninsula and an adjacent island on the western shore of Island Lake. Relief is irregular with local variation in elevation of up to 20 metres. Bedrock outcrop and near surface bedrock extends over most of the area. Overburden is lacustrine silt and sand at lower elevations and scattered till deposits at higher levels. A kame some 16 miles south of the community on the winter road route forms an extensive deposit of granular material. Forest cover in the area is continuous, mostly spruce and of a good size.

14.2 POPULATION AND INCOME

The current population of the community of St. Theresa Point is estimated at 1450, an increase from the 1313 reported in 1978. As in most of the communities, younger age cohorts dominate the population pattern. In 1978 some 46 percent of the population was less than 14 years of age.

Commercial fishing, trapping, service industries and community works projects generate some income, but per capita income in 1974 was estimated at only $690 and since that time the commercial fishing industry has declined and employment in a local fish processing plant has been discontinued. Unemployment is high.

14.3 ENERGY PROFILE

A description of current facilities and energy use in St. Theresa Point is shown in Tables 14.1, 14.2 and 14.3.

TABLE 14.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - ST. THERESA POINT

Consumptive Group	Facilities
Education	School with gym (4327 m²), detached classroom building (465 m²), 5 teacherage buildings, including 2 trailers (815 m²): heat from oil-fired boilers, propane water heater, dryer and stove in trailers.
Health	Single-storey frame nursing station (364 m²), 2 residences (58 m² trailers), and garage (54 m²): full-time use, oil heat, electric lights, fridges, stoves, freezers, washers, dryers, some propane used; unheated boat-house, powerhouse.
Communications	Telephone exchange (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, oil heat.
Transport Services	Airport terminal (120 m²): oil heat.
Community Services	Administrative office and community hall; water supply, standpipes and pumphouse; outdoor lighting.
Commercial - major	Store with 2 service residences: oil heat; warehouse.
- minor	Store, local enterprises, church complex.
Residential	191 houses with electrical service (early 1982).

TABLE 14.2

ENERGY PROFILE - ANNUAL CONSUMPTION - ST. THERESA POINT

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (1 in 000's)	Propane (1 in 00's)	Wood (cords)
Education	550	360	40	-
Health	40	19	2	-
Protection	-	-	-	-
Communications	9	4	-	-
Transport Services	13	6	-	-
Other Government	-	-	-	-
Community Services	59	11	-	30
Commercial - major	154	16	-	-
- minor	56	11	-	30
Residential	956	-	-	2903
Total	1837	427	42	2963

TABLE 14.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - ST. THERESA POINT

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	8617	13932	109	-	22658
Health	627	735	5	-	1367
Protection	-	-	-	-	-
Communications	141	155	-	-	296
Transport Services	204	232	-	-	436
Other Government	-	-	-	-	-
Community Services	924	426	-	-	1824
Commercial - major	2413	619	-	-	3032
- minor	877	426	-	474	1777
Residential	14979	-	-	45867	60846
Total	28782	16525	114	46815	92236

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 15

15.0 COMMUNITY PROFILE - SHAMATTAWA

15.1 PYSICAL SETTING

Shamattawa is located on the eastern bank of God's River at the mouth of Echoing River. The community occupies a broad bench lying 5 to 10 metres above river level. Except for the river bank relief is flat. Surface materials over the surrounding area are mainly granular marine deposits most of which is permanently frozen. Forest cover is sparse in the immediate vicinity of the community although good stands of jackpine and spruce of saw-log size are found within 20 km.

15.2 POPULATION AND INCOME

The current population of Shamattawa is estimated at 680, an increase from the 580 reported in 1978. In 1978, 52 percent of the population was under fifteen years of age and only 3 percent over 65 years. The population is increasing rapidly.

The provision of local services, works project and a modest amount of trapping yield a fairly low income in Shamattawa. Unemployment is high. Per capita income in 1974 was estimated at about $500, slightly below the average of remote communities in Manitoba.

15.3 ENERGY PROFILE

A description of current facilities and energy use in Shamattawa is shown in Tables 15.1, 15.2 and 15.3.

TABLE 15.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - SHAMATTAWA

Consumptive Group	Facilities
Education	2 large classroom buildings (315 m²), 2 detached classrooms (160 m²), 4 single teacherages (342 m²): oil heat, some propane appliances.
Health	Nursing station (201 m² trailer), 1 residence (58 m² trailer), and garage (36 m²): full-time use, oil heat, electric fridge, stove, freezer, washer, dryer, lights; new nursing station and integral residence under construction.
Protection	Patrol cabin with office and cells (78 m² trailer), sleeping quarters (78 m² trailer): not in full-time use, oil heat, electric stove, hot water.
Communications	Telephone exchange: rented space at airport.
Transport Services	Airport terminal, equipment shelter, and shop (186 m²): oil heat.
Community Services	Administrative office (130 m²): oil heat; community hall (234 m²): wood and oil heat; outdoor lighting.
Commercial - major	Store with 2 service residences and warehouses: oil heat.
- minor	Motel (58 m²), store (89 m²), church.
Residential	67 houses with electrical service (early 1982).

TABLE 15.2

ENERGY PROFILE - ANNUAL CONSUMPTION - SHAMATTAWA

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (l in 000's)	Propane (l in 00's)	Wood (cords)
Education	96	62	61	-
Health	81	29	-	-
Protection	9	7	-	-
Communications	-	-	-	-
Transport Services	13	16	-	-
Other Government	-	-	-	-
Community Services	47	17	-	27
Commercial - major	72	18	-	-
- minor	7	14	1	18
Residential	248	-	-	1206
Total	573	163	62	1251

TABLE 15.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - SHAMATTAWA

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	1629	2399	166	-	4194
Health	1375	1122	-	-	2497
Protection	153	271	-	-	424
Communications	-	-	-	-	-
Transport Services	221	619	-	-	840
Other Government	-	-	-	-	-
Community Services	798	658	-	427	1883
Commercial - major	1222	697	-	-	1919
- minor	119	542	3	284	948
Residential	4209	-	-	19055	23264
Total	9726	8308	169	19766	35969

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 16

16.0 COMMUNITY PROFILE - TADOULE LAKE

16.1 PHYSICAL SETTING

The community of Tadoule Lake is situated on the western shore of Tadoule Lake which is part of the South Seal River drainage. The general area is characterized by bedrock outcrop and varied glacial deposits although the community is in an area of sandy overburden derived from an adjacent esker. The lakeshore in the vicinity is formed mainly of sandy beaches. Permafrost is present throughout most of the area. Forest cover is thin, generally small mixed poplar, spruce and jackpine, but is adequate as a fuel-wood supply and easily accessible.

16.2 POPULATION AND INCOME

Tadoule Lake is a relatively new community formed by a group of people who left Churchill to return to more traditional life styles. The current population is estimated at 215.

Cash income is low. Some income is earned from trapping and handicrafts and from service industries and community works projects.

16.3 ENERGY PROFILE

A description of current facilities and energy use in Tadoule Lake is shown in Tables 16.1, 16.2 and 16.3.

TABLE 16.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - TADOULE LAKE

Consumptive Group	Facilities
Education	1 detached classroom (98 m²), 1 classroom/teacherage (160 m²), 1 teacherage (100 m²): oil heat, propane appliances.
Health	Single-storey frame health station (198 m²), single-storey frame storage/powerhouse (16 m²): used by visiting health personnel, but heated with oil full time, electric fridge, lights, washer, freezer, propane stove and dryer.
Communications	Telephone exchange (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, electric heat.
Community Services	Administrative office; community hall (89 m²); outdoor lighting.
Commercial - minor	Store (327 m²): oil heat; pool hall (89 m²).
Residential	Approximately 25 - 30 houses.

TABLE 16.2

ENERGY PROFILE - ANNUAL CONSUMPTION - TADOULE LAKE

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (1 in 000's)	Propane (1 in 00's)	Wood (cords)
Education	40	31	66	-
Health	24	13	4	-
Protection	-	-	-	-
Communications	35	-	-	-
Transport Services	-	-	-	-
Other Government	-	-	-	-
Community Services	19	11	-	10
Commercial - major	-	-	-	-
- minor	15	14	-	19
Residential	60	-	-	483
Total	193	69	70	512

TABLE 16.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - TADOULE LAKE

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	774	1200	180	-	2154
Health	464	503	11	-	978
Protection	-	-	-	-	-
Communications	677	-	-	-	677
Transport Services	-	-	-	-	-
Other Government	-	-	-	-	-
Community Services	368	426	-	158	952
Commercial - major	-	-	-	-	-
- minor	290	542	-	300	1132
Residential	1161	-	-	7631	8792
Total	3735	2670	190	8090	14685

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 17

17.0 COMMUNITY PROFILE - THICKET PORTAGE

17.1 PHYSICAL SETTING

Thicket Portage is located on the CNR Churchill railway line on the divide between Wintering Lake, draining to the Grass River and Landing Lake draining to the Nelson River. Relief is irregular with a maximum local variation in elevation of up to 30 metres. Bedrock is generally close to the surface although outcrops are infrequent except near the lakeshore. Overburden is generally shallow lacustrine silt and clay overlying till. Forest cover is moderately heavy and continuous and mostly mixed spruce, jackpine and poplar.

17.2 POPULATION AND INCOME

The current population of Thicket Portage is estimated at 200, a decrease from the 229 reported in 1978. In the seven years prior to 1978 the population of this community had declined by 36 percent.

Thicket Portage is located on the CNR line which generates, directly and indirectly, considerable employment to supplement fishing, trapping and the service industries. This is the most prosperous of the remote communities. Per capita income in 1974 was estimated to be over $1000, about double the average for the fifteen communities.

17.3 ENERGY PROFILE

A description of current facilities and energy use in Thicket Portage is shown in Tables 17.1, 17.2 and 17.3.

TABLE 17.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - THICKET PORTAGE

Consumptive Group	Facilities
Education	5 classroom school with gym (829 m²), 1 duplex unit and 2 single-family teacherages: oil heat, some propane appliances.
Health	Integral nursing station and residence (143 m² trailer): in full-time use, oil heat, propane dryer, water heater.
Protection	Integral patrol cabin and sleeping quarters (78 m² trailer): not in full-time use, oil heat, hot water.
Communications	Telephone exchange (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, oil heat.
Transport Services	Railway station and residence: oil heat. Airport terminal (24 m²), equipment shelter and shop (154 m²): oil heat.
Other Government	Conservation bunkhouse and warehouse.
Community Services	Administrative office; community hall (150 person capacity); water supply and treatment system, standpipes: propane and electric heat; outdoor lighting.
Commercial - minor	2 stores, pool hall, churches.
Residential	34 houses with electrical service (early 1982).

TABLE 17.2

ENERGY PROFILE - ANNUAL CONSUMPTION - THICKET PORTAGE

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (1 in 000's)	Propane (1 in 00's)	Wood (cords)
Education	65	70	12	-
Health	16	6	15	-
Protection	6	6	-	-
Communications	11	4	-	-
Transport Services	33	15	-	-
Other Government	1	-	-	-
Community Services	99	22	7	25
Commercial - major	-	-	-	-
- minor	16	25	-	17
Residential	153	-	-	568
Total	400	148	34	610

TABLE 17.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - THICKET PORTAGE

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	1080	2709	33	-	3822
Health	266	232	41	-	539
Protection	100	232	-	-	332
Communications	183	155	-	-	338
Transport Services	548	581	-	-	1129
Other Government	17	-	-	-	17
Community Services	1644	851	19	395	2909
Commercial - major	-	-	-	-	-
minor	266	968	-	269	1503
Residential	2541	-	-	8974	11515
Total	6644	5728	92	9638	22102

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 18

18.0 COMMUNITY PROFILE - WAASAGOMACH

18.1 PHYSICAL SETTING

The community of Waasagomach is located on the western shore of Island Lake about 12 km to the north of St. Theresa Point. Relief is irregular with local variation in elevation of up to 12 metres. Bedrock is near the surface throughout the area but outcrops are scattered except near the lakeshore. Overburden is predominantly till with lacustrine silt and clay at lower elevations. Forest cover is moderately heavy, continuous, and mostly spruce.

18.2 POPULATION AND INCOME

Waasagomach, in the Island Lake area, is one of the most rapidly growing communities. Current population is estimated at 730, an increase from the 615 reported in 1978. During the seven years prior to 1978 the population of this community increased by 58 percent. In common with other communities in the group, the population is relatively young with more than fifty percent being fourteen years of age or less in 1978.

The economy of the community is characterized by low income and high unemployment. Some income is earned from commercial fishing, trapping and service industries, and some from community works projects. Per capita income in 1974 was estimated to be only $400, among the lowest of the remote communities.

18.3 ENERGY PROFILE

A description of current facilities and energy use in Waasagomach is shown in Tables 18.1, 18.2 and 18.3.

TABLE 18.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - WAASAGOMACH

Consumptive Group	Facilities
Education	School with gym (3374 m²), 3 teacherages, including multiple units (708 m²): oil heat, propane stove and dryer in one teacherage.
Health	Single-storey frame nursing station (170 m²), 1 residence (77 m² trailer): full-time use, oil heat, electric fridge, stove, lights, washer, dryer; single-storey frame powerhouse (6 m²), garage (33 m²), and storage building (6 m²): electric heat.
Communications	Telephone exchange (53 m²): unmanned, electrical equipment and air conditioning, waste heat from equipment, electric heat; T.V. and radio transmitters in separate building: waste and electric heat.
Community Services	Administrative office (214 m²); community hall; water supply system; sewage treatment plant (91 m²); outdoor lighting.
Commercial - major	Store with 2 service residences and warehouse: oil heat.
- minor	Laundromat (45 m² trailer), woodworking shop, store, churches.
Residential	Approximately 89 houses with electrical service (early 1982).

TABLE 18.2

ENERGY PROFILE - ANNUAL CONSUMPTION - WAASAGOMACH

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities			
	Electricity (MWh)	Fuel Oil (1 in 000's)	Propane (1 in 00's)	Wood (cords)
Education	403	215	36	-
Health	68	12	-	-
Protection	-	-	-	-
Communications	97	-	-	-
Transport Services	-	-	-	-
Other Government	-	-	-	-
Community Services	31	23	-	15
Commercial - major	99	17	-	-
- minor	16	17	-	30
Residential	427	-	-	1353
Total	1141	284	36	1398

TABLE 18.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - WAASAGOMACH

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities				
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Wood (GJ)	Total (GJ)
Education	6140	8321	98	-	14559
Health	1036	464	-	-	1500
Protection	-	-	-	-	-
Communications	1478	-	-	-	1478
Transport Services	-	-	-	-	-
Other Government	-	-	-	-	-
Community Services	472	890	-	237	1599
Commercial - major	1508	658	-	-	2166
- minor	244	658	-	474	1376
Residential	6506	-	-	21377	27883
Total	17384	10991	98	22088	50561

1 Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

CHAPTER 19

19.0 COMMUNITY PROFILE - CHURCHILL

19.1 PHYSICAL SETTING

The town of Churchill is located on the shore of Hudson Bay at the mouth of the Churchill River. Relief is mostly gentle to flat. The immediate area of the townsite is characterized by low and bare rock outcrop although the surrounding area is generally covered by extensive deposits of marine silts and clays providing a flat, poorly drained surface. Sandy material of the same origin lies to the west of the townsite. All is extensively permafrost-affected. Forest cover is almost non-existent being mainly open tundra.

19.2 POPULATION AND INCOME

The current population of the Town of Churchill is estimated at approximately 1600, a decline from the 1976 population of 1700.

Churchill functions as a seaport, as an air transport centre, and as an administrative centre. Vestigial functions include national defence, defence research and civilian reseach. There is a modest tourist business. Administration functions including wildlife management, welfare, health, education, and maintenance of telecommunication service have probably shrunk to the lowest levels possible, and operations of transportation facilities are also unlikely to decline much further. On the other hand, resource development or changed service or administration needs in

northeastern Canada may require expansion of the functions of this community.

19.3 ENERGY PROFILE

A description of current facilities and energy use in Churchill is shown in Tables 19.1, 19.2 and 19.3.

TABLE 19.1

ENERGY PROFILE - DESCRIPTION OF FACILITIES 1982 - CHURCHILL

Consumptive Group	Facilities	
INSTITUTIONAL		
Federal Government		
Airport:	hangar	oil fired boiler
	garage	oil fired boiler
	six or seven smaller buildings	propane or oil heat
	runway lights	
	12 standby generators	
Other Facilities:	CNR station	propane heat
	CBC radio transmitter	
	National Research Council research station, several buildings	oil heat, some propane
Offices:	RCMP building, 2 storeys (volume = 1285 m^3)	propane heat
	Post Office building, 1 storey (398m^2)	propane heat
	Government of Northwest Territories building; offices in other buildings for Parks Canada and Department of Communications	probably propane heat
Provincial Government		
Communication Facilities:	Manitoba Telephone System dial office	propane heat
	MTS transmitting site	oil heat
Offices:	offices and facilities in various buildings for Liquor Control Commission, Renewable Resources, Energy and Mines, Government Services, Churchill Housing Authority	probably propane heat

Local Government District

Town Centre:	multi-storey complex hospital with 31 beds; other facilities including school; LGD offices; recreational facilities including ice rink, curling rink, swimming pool, 2 gyms, theatre, bowling lanes and billiard room	3 oil-fired boilers
Elementary school:	detached building	propane heat
Other Facilities:	water treatment plant	oil heat
	water distribution system	oil heat
	sewage treatment plant	waste heat
	firehall	propane heat
	public works garage	propane heat

INDUSTRIAL

Harbour:	steam heating plant	2-150 hp boilers 30 kW standby generator
	harbour office (670 m²); machine shop = (3500 m²)	steam heat
	dock office, used in shipping season only	steam heat
	offices in grain elevator	electric heat
	grain cleaning and dock equipment	electric heat
	trailers with accommodation for 120 men; trailers used as dining and recreation rooms, used in shipping season only	propane heat
	pellet-making plant (Arctic Grain Ltd.), shares building with harbour steam plant and uses steam	

COMMERCIAL

Major Commercial	department store (Hudson's Bay Company)	propane heat

Other Commercial	one other department store; about 25 smaller commercial establishments, some in shared premises; 4 motels and hotels, 2 churches and a mission building; one farming operation	mostly propane, some oil heat
RESIDENTIAL		
Churchill Housing Authority:	204 houses in clusters of 2, 3, 4 or 5	propane heat
	102 apartment units in five buildings	propane heat
	20 apartment units in one building	electric heat
Churchill Health Centre:	3 houses	propane heat
	31 apartment units in two buildings	propane heat
Private:	approx. 150 houses and trailers used all year	48 electric heat 80 propane heat 20 oil heat

TABLE 19.2

ENERGY PROFILE - ANNUAL CONSUMPTION - CHURCHILL

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities		
	Electricity[1] (MWh)	Fuel Oil[2] (1 in 000's)	Propane[2] (1 in 000's)
Airport	1542	1248	79
CNR station	336	-	80
CBC transmitter	26	-	-
NRC buildings	853	(N/A)	3
RCMP building	62	-	25
Post Office building	44	-	35
Other federal government	179	-	60[3]
MTS buildings	123	-	3
Other provincial government	129	-	40[3]
Town Centre - hospital	1146	738	-
- other facilities	2198		
Elementary school	144	-	186
Other local government	1472	437	100[3]
Total Institutional	8254	2423	611
Harbour	3376	564	103
Other Industrial	409	-	-
Total Industrial	3785	564	103
Major Commercial	257	-	83
Other Commercial	1739	-	570[3]
Total Commercial	1996	-	653

TABLE 19.2 - (continued)

ENERGY PROFILE - ANNUAL CONSUMPTION - CHURCHILL

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities		
	Electricity[1] (MWh)	Fuel Oil[2] (l in 000's)	Propane[2] (l in 000's)
Housing Authority			
47 houses (fed., pre-1975)	1054	-	400
138 houses (prov., pre-1975)	1953[4]	-	1362
19 houses (prov., post-1975)	269[4]	-	88
42-unit apartment building	317	-	168
24-unit apartment building	182	-	95
20-unit apartment building (electrical)	613	-	-
14-unit apartment building	185	-	85
14-unit apartment building	183	-	86
8-unit apartment building	120	-	69
Health Centre			
3 houses (pre-1975)	42[4]	-	33[5]
26-unit apartment building	229	-	95[5]
5-unit apartment building	154	-	43[5]
Total: propane pipeline	5301		2629[6]

TABLE 19.2 - (continued)

ENERGY PROFILE - ANNUAL CONSUMPTION - CHURCHILL

Consumptive Group	Annual Energy Consumption - Basis 1982 Facilities		
	Electricity[1] (MWh)	Fuel Oil[2] (l in 000's)	Propane[2] (l in 000's)
Private Residential			
electric heat	2032[7]		
other	1616[4]	105[8]	313[9]
Total Residential	8949	105	2942
Total	22984	3092	4309[9]

1. Manitoba Hydro records, 1980/81.
2. Based on annual consumption reported by user, except as noted.
3. Non-residential consumption subtracted from Steelgas 1981 non-residential deliveries, remainder divided among government and commercial facilities.
4. Estimated from total consumption of 160 Churchill Housing Authority (CHA) houses as noted, along with approximately 100 private residences, and a number of other connections, e.g., seasonal residences.
5. Estimate based on consumption figures for similar CHA buildings.
6. Steelgas deliveries in 1981 to CHA, total includes pipeline losses.
7. Includes lights, power, heat for 48 houses.
8. Estimated on basis of 20 oil-heated houses.
9. Steelgas deliveries, 1981.

TABLE 19.3

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - CHURCHILL

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities			
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Total (GJ)
Airport	20649	48298	2149	71096
CNR station	4499	-	2176	6675
CBC transmitter	348	-	-	348
NRC buildings	11423	(N/A)	82	11505
RCMP building	830	-	680	1510
Post Office building	589	-	952	1541
Other federal government	2397	-	1632	4029
MTS buildings	1647	-	82	1729
Other provincial government	1727	-	1088	2815
Town Centre - hospital - other facilities	15346 29433	28561	-	73340
Elementary school	1928	-	5059	6987
Other local government	19712	16912	2720	39344
Total Institutional	110529	93770	16619	220918
Harbour	45208	21827	2802	69837
Other Industrial	5477	-	-	5477
Total Industrial	50695	21827	2802	75314
Major Commercial	3441	-	2258	5699
Other Commercial	23287	-	15504	38791
Total Commercial	26728	-	17762	44490

TABLE 19.3 - (Continued)

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - CHURCHILL

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities			
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Total (GJ)
Housing Authority				
47 houses (fed., pre-1975)	14114	-	10880	24994
138 houses (prov., pre-1975)	26153	-	37046	63199
19 houses (prov., post-1975)	3602	-	2394	5996
42-unit apartment building	4245	-	4570	8815
24-unit apartment building	2437	-	2584	5021
20-unit apartment building (elec. heat)	8209	-	-	8209
14-unit apartment building	2477	-	2312	4789
14-unit apartment building	2451	-	2339	4790
8-unit apartment building	1607	-	1877	3484
Health Centre				
3 houses (pre-1975)	562	-	898	1460
26-unit apartment building	3067	-	2584	5651
5-unit apartment building	2062	-	1170	3232
Total: propane pipeline	70986		71509[3]	142495[2]

TABLE 19.3 - (Continued)

ENERGY PROFILE - SOURCE FUEL CONSUMPTION - CHURCHILL

Consumptive Group	Annual Source Fuel Consumption[1] - Basis 1982 Facilities			
	Electricity (GJ)	Fuel Oil (GJ)	Propane (GJ)	Total (GJ)
Private Residential				
electric heat	27211	-	-	27211
other	21640	4064	8514	34218
Total Residential	119836	4064	80022	203922
Total	307779	119660	117205	544644

1. Tabled values are energy content of source fuels: electricity is converted from MWh using annual diesel generation efficiency for community given in Table 2.2 and fuel oil energy content assumption given in Table 2.1; fuel oil, propane, and wood are converted from litres, litres, and cords, respectively, using fuel energy content assumptions given in Table 2.1; columns may not sum to totals due to rounding.

2. Total includes pipeline losses.

REFERENCES

1. Department of Communications - Central Region, Manitoba North Community Profiles, January 1982.

2. Manitoba Department of Northern Affairs, 1981 Northern Affairs Community Reports, October 1981.

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